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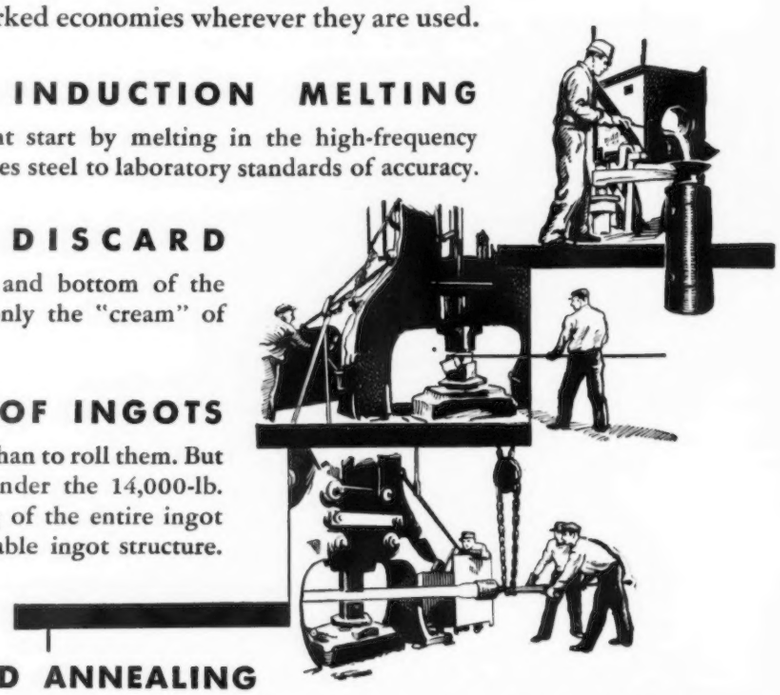

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FEBRUARY 1, 1934

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Vol. 133, No. 5

Scuttling the NRA?

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INDUSTRY is becoming reconciled to its shot gun marriage to NIRA. The young lady has her faults and we have discussed them freely in these columns. By and large, however, General Johnson has succeeded remarkably well in keeping NIRA's feet in the straight and narrow path.

But now a disturbing element intrudes upon this state of comparative conjugal equilibrium. Senator Borah and others take up their cudgels in behalf of the small business man, claiming, of NIRA, that "she done him wrong." And the Federal Trade Commission, which appears to "want in" on a job that it might have done but didn't, is murmuring "come up and see me some time."

Political commentators point to these doings as the beginning of an attack upon the NRA. If it should so develop, we hope and believe that the metal-working industry will stand back of General Johnson.

As administrator of American industry, the General, next to the President, has been shouldering the heaviest load of any man in present day public life. And he has progressed further and faster with it than any of the other lesser emergency load carriers who started from scratch with him.

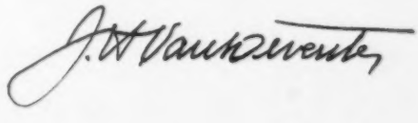
The General has made mistakes, being human and not supernatural and being under tremendous pressure for quick results. He has done some things that we have not liked. A number of these he has had to do under the terms of a law which he did not write but which was given to him to administer. We doubt if there is any other man who, under similar conditions, could have made a better score to date.

One of the reasons why industry should support General Johnson is that he has kept his organization so free from brain trusters and constitution busters. It is the most practically minded set-up of the entire alphabetical array. To turn over the intricate creative problems of industry now facing NRA to the legalistically and literally minded Federal Trade Commission would be not merely to set back the recovery clock but to break off its hands as well.

EQUALLY threatening to the interests of both employers and wage earners is Senator Borah's proposal to disembowel the Recovery Act with the rusty "anti-trust" knife which President Roosevelt has placed, temporarily, on the shelf. Such action would completely wipe out the gains made through code cooperation and leave only the wage, hour and unionization clauses of Section 7 operative. Thus employers would have nothing to show for their pains but unionized plants and the privilege of paying high wages. Even these would not long remain, for let the hungry wolf of price competition get his head back into industry's door and the carefully built wage standards of NRA will topple like a house of cards. Labor would then get its coveted 30-hour week or it might even be a 20-hour one.

Certainly we do not want to see the small industrialist or business man penalized through injustices in codes. So far as the steel code is concerned, the small consumer is in better position than ever before, being able to buy his small requirements at the same price paid by the largest consumer.

There are probably clauses in many hastily constructed codes that need revision. But when our clothes need altering, we take them to a tailor who knows how they were made, not to a plumber. It would be equally foolish to intrust the job of code alteration to Congress or to the Federal Trade Commission.



Industrial

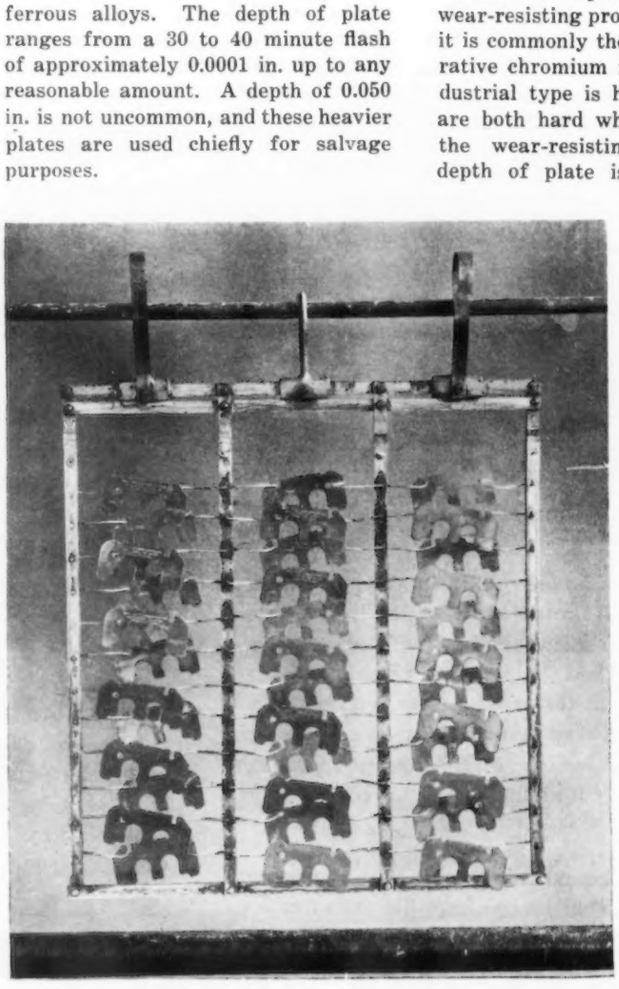
THIS is the first of two articles in which Mr. Nemser, an authority on the subject, reviews progress and practice in the comparatively new art of industrial chromium plating.

In this first installment, the properties of chromium plate are succinctly set forth, as applied for decorative and for wear-resisting purposes. In the concluding article, which will follow in our succeeding issue, practical application to tools, dies, etc., is discussed. This is a part of our general series on metal finishing.

TWO distinct types of chromium plating have been developed, the decorative and the industrial or wear resisting. The decorative is by far the most commonly encountered, being extensively used for automotive fittings and hardware, plumbing fixtures, miscellaneous hardware and cutlery. Ordinarily this form of plate consists of a soft steel base on which are applied successive layers of copper, nickel and finally a three to five minute flash of chromium. The nickel is usually buffed. The resulting chromium is of a bluish cast as compared to the yellowish cast of nickel. The chromium is extremely thin, approximately 0.00002 in. to 0.00004 in. in depth. It sometimes is termed a metallic lacquer. This combination offers excellent corrosion resistance. The chromium protects the softer plates beneath and inherently remains passive to atmospheric conditions, while the nickel forms a continuous film, protecting the steel part. The thin film of chromium will form a fairly continuous surface and be less likely to show cracks or pinhead leaks than the heavier plates.

Industrial or wear-resisting plate never will become as well known as the decorative. Nevertheless it is filling an increasingly important industrial role. Usually this type of plate is applied directly to a fully or semi-hardened steel base. Successful applications also are being made on soft steel, cast iron and many nonferrous alloys. The depth of plate ranges from a 30 to 40 minute flash of approximately 0.0001 in. up to any reasonable amount. A depth of 0.050 in. is not uncommon, and these heavier plates are used chiefly for salvage purposes.

This "hard" plate possesses unusual wear-resisting properties. Incidentally it is commonly thought that the decorative chromium is soft while the industrial type is hard. Actually they are both hard when considered from the wear-resisting standpoint. The depth of plate is very thin in the



ABOVE

Buffing a chromium plated concave break down roll made for the brass industry, using a Kellerflex flexible shaft machine designed for this purpose.

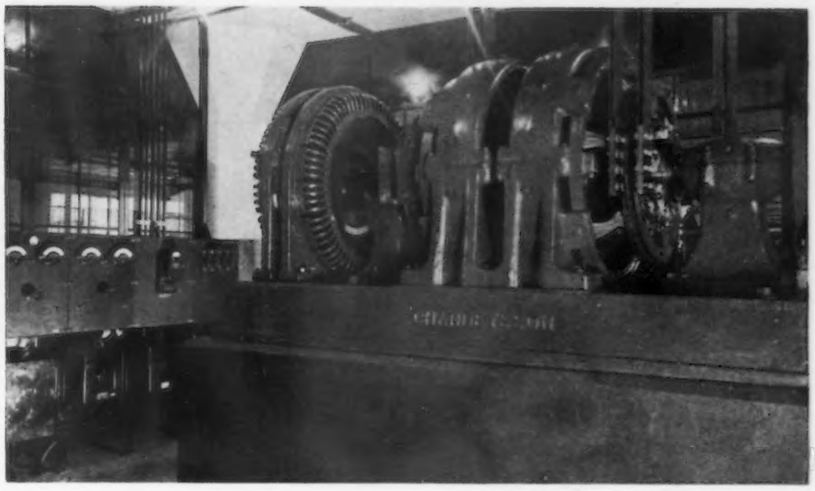
AT LEFT

Typical set-up for light plating flat steel railroad gages. These pieces have been carburized, hardened, ground and then plated to a depth of 0.0003 in.

Chromium Plating—9

By D. A. NEMSER
Chief Metallurgist, Pratt & Whitney Co.

decorative scheme and is deposited on extremely soft underlayers so that any testing action indicates a soft material. The heavier industrial plates on the harder bases can be tested properly and a truer result obtained. Schneidewind reports that electrodeposited chromium plate has the following hardness values: Vickers-Brinell 625, Mohs 8 and scratch width with Bierbaum microcharacter test of 2 microns. While the impression hardness is not very high, the scratch tests indicate outstanding wear resistance. The hardness figures will undoubtedly vary with changes in plating conditions such as concentration of electrolyte, composition of electrolyte, temperature and current density. Willink has indicated outstanding wear resistance on parts plated under unusual conditions. He reports that when using a high temperature together with a high current density with consequent increase in voltage, the wear resistance is raised over three to one as compared to that of chromium plate deposited under the so-called standard conditions.



Piersol also has investigated the variations in plate hardness and as a result, has designed a testing machine to measure the relative abrasive resistance of chromium plates, deposited under variant physical and chemical conditions. Briefly this equipment consists of a special grinding wheel operated under uniform conditions, and so mounted that a definite and constant wheel pressure is exerted against the plated test piece. The wear resistance usually is expressed in terms of depth of cut in unit time.

In general, it can be said that chromium plate possesses much greater abrasive resistance than any type of fully hardened tool or die steel. It is somewhat superior to the nitrided steels in this respect. The diamond and the cemented carbides of tungsten

(*Concluded on Page 76*)

▲ ▲ ▲

ABOVE

Generating unit which supplies electrical plating energy for the installation shown in Fig. 1.

AT RIGHT

Pratt & Whitney chromium plating department showing the preliminary cleaning tanks in the foreground and the two plating tanks beyond.

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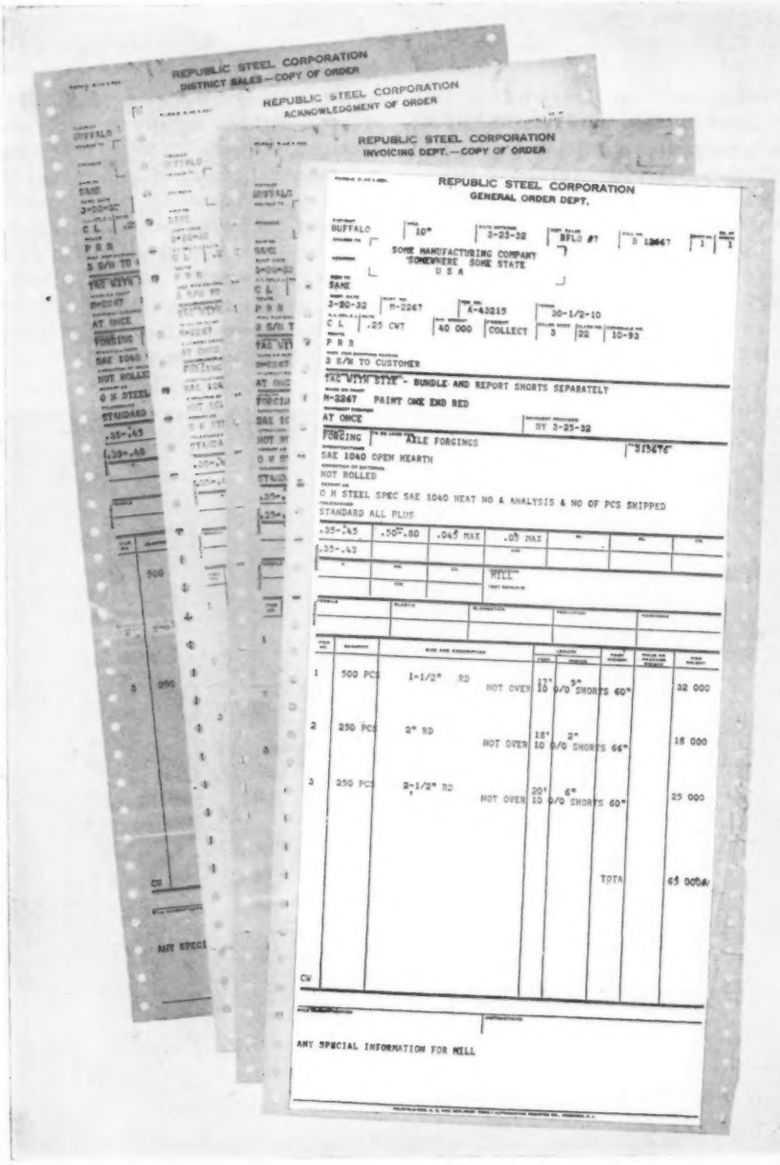
Speeding Between and

(Above): Battery of machines in the order department of the company at Youngstown.
(Below): A group of order forms, simultaneously written by teletype transmission.

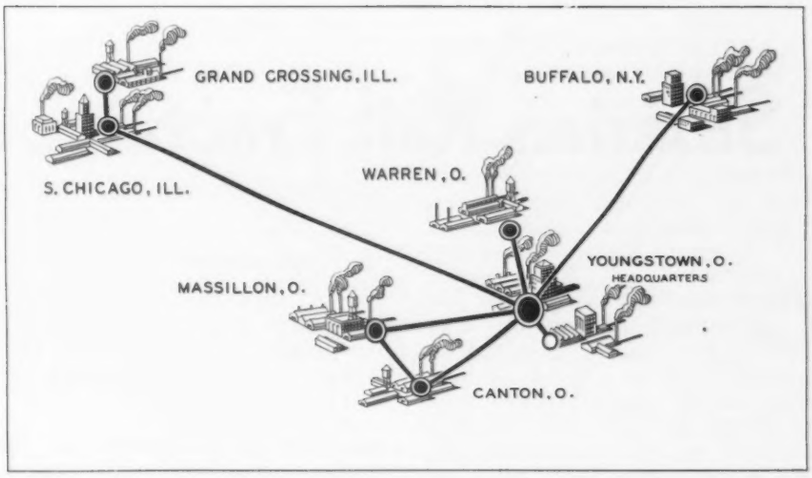


IT is a well known fact to those engaged in the production of basic commodities that processors and manufacturers of finished products, due to the intermittent demand for their goods by the public, are carrying practically no inventories of materials today. The steel industry in times like these finds itself linked closer then ever with the ultimate consumer and its activities governed more exactly by the fluctuations of consumer demand. The delay between the time the consumer makes known his demand and the time that the basic industry is aware of this demand no longer exists, or at least it exists only in a minor degree. The buffer in the form of large manufacturers' inventories has been removed.

This "hand-to-mouth" buying by manufacturers of finished products demands close attention on the part of the supplying manufacturer to the speed with which orders are handled after they are received from the customer. A large percentage of orders received by the steel company today are either telephoned or telegraphed by the customer, and the customer, pressed by the exigencies of "hand-to-mouth" buying, has come to expect the same speed in the transmission of his orders from the office where they are received to the point where production is started.

The many plants of the Republic Steel Corpn., scattered in several directions from Youngstown, where general office and sales forces are located, permit the elimination of expensive crosshauling of finished products through systematized production and distribution, but their distance from Youngstown precludes speedy transmission of orders from office to plant by ordinary means. The obstacles pre-

Orders Office Plant



▲▲▲ Diagram showing Republic Steel Corpn's system of teletypewriter communication.

By R. J. MORGAN
Manager of Orders, Republic Steel Corpn.

sented by geographical remoteness were overcome by the installation of a teletypewriter system which combines the speed of the telephone with the accuracy of the written word, and at the same time provides written records to be used as working and file papers and as a check on accuracy.

What the Teletypewriter Is

The teletypewriter is a machine which makes possible the transmission of written messages just as the telephone transmits speech. The teletypewriter has a keyboard similar to that of an ordinary typwriter, and messages typed on the sender appear simultaneously on the receiving machine exactly as they are written on the sender. The two are connected by Bell System private wires. The sending machines are also equipped to receive messages, so that operators using two of these combination machines may "talk back and forth in writing," just as two persons may carry on a conversation by telephone. The various models print on tape ⅜ in. wide, on page paper 8½ in. wide, or on forms especially developed for particular uses.

The Republic Steel Corpn. first set up a teletypewriter system in which the machines printed on page paper in rolls. The essential details of orders coming into the Youngstown office were transmitted by teletypewriter to the plant. Later this order was retyped on a regular form and the copies distributed to the proper departments. The copy for the mill was sent by mail to the plant where it was checked with the memo sent previously by teletypewriter.

After we had given the teletypewriter system a thorough tryout and found that it enabled us to give our customers the service to which they were accustomed even though they indulged in "hand-to-mouth" buying, we converted the system into a form writing one, substituting form writing machines for the message writing teletypewriters after we had redesigned our formal mill order form to fit the teletypewriter machines.

CUSTOMER service has always been important. But today, and in industries where price competition has been more or less removed through codification, it is more important than ever.

One of the most necessary components of good customer service is prompt delivery. And prompt delivery means taking out lost minutes all along the line, from initial order to final delivery.

This article tells how the Republic Steel Corpn., by means of teletypewriter connection to various plants, takes the lost minutes out of the transmission of orders.

The form writing teletypewriters have a "positive drive" arrangement, which keeps the forms in perfect alignment. The positive drive feature, however, does not prevent the machine being used for general message use. After the paper has been changed in the machines at both ends of the circuit, messages can be sent back and forth.

The teletypewriter system of the Republic Steel Corpn. consists of 21 machines. Circuits connecting form writing machines radiate from the general office in Youngstown to the mill offices at Buffalo, Canton, Chicago, Massillon, Warren, and Youngstown. Separate from this general system, there are circuits connecting Canton and Massillon, the sales office and mill in Buffalo, the sales office and mill in South Chicago, the mill at South Chicago and the mill at Grand Crossing. In addition, there are "teletypewriter exchange service" machines in the general office in Youngstown, the sales offices in Cleveland, Massillon, Philadelphia, Indianapolis, and Cincinnati, used chiefly for messages having to do with sales and servicing activities. Teletypewriter exchange service is similar to exchange telephone service, except that teletypewriters instead of telephones are connected through local or long distance central offices, permitting the interchange of typed messages instead of spoken words.

How the System Functions

Although we receive the largest number of orders at Youngstown, orders for the alloy steel division are received at its headquarters at Massillon and transmitted over the teletypewriter circuit between Massillon and Canton, while orders for wire are received at South Chicago, going by teletypewriter to the wire plant at Grand Crossing. Since the procedure is essentially the same at all three points, I shall describe only the teletypewriter routine at Youngstown.

Orders received at the Youngstown

(*Concluded on Page* 66)

Siberian Rail Fractures Numerous at L

By B. M. SUSLOV
Metallurgical Engineer, Research Institute, Grosneft Trust, U. S. S. R.

ON the Siberian railroad lines breakages of tires, car axles and locomotive frames have long been noted as a winter phenomenon. Rails especially have been known to fracture suddenly during times of an appreciable fall in the atmospheric temperature.

Brittleness of rail steel was particularly noticeable during the winter of 1929-1930, when the temperature dropped to minus 50 deg. C., or minus 58 deg. F. This brought about intensive study on the part of Prof. V. Koosnetsov and Engineer K. Federov at Tomsk, Siberia. The Tomsk railroad management published a table of breakages for the period of October, 1928, to April 1930, which is here reproduced in American units. The temperatures are given on the Fahrenheit scale. The striking relationship between low temperatures and rail brittleness is brought out in Fig. 1, which shows the monthly temperatures, and the number of rails put out of service owing to "cross-section" fracture.

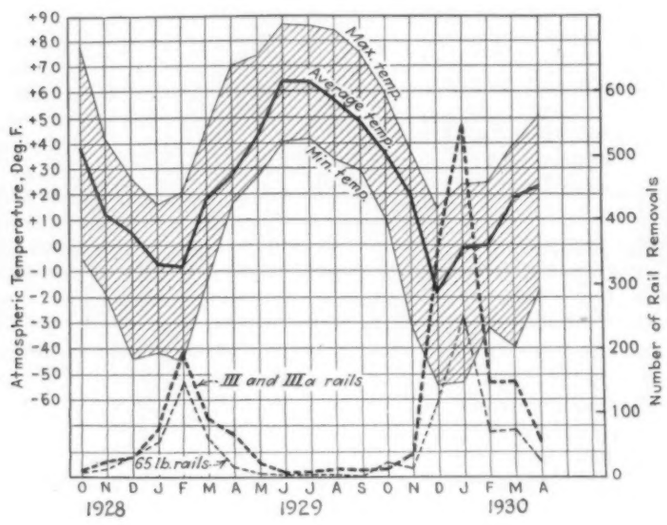


Fig. 1—Breakages of both heavy and medium weight rails, reported from railroad records at Tomsk, Siberia, showed sudden increases at times of low temperature.

The Tomsk line management claims the rails have to be removed for the following reasons:

1. Cross-section fracture
2. Chipping
3. Cracks and pinholes
4. Other defects

The number of rails removed for reasons other than the first mentioned cause was not important and the figures for these were not included in the table. Yet it may be assumed that prevalence of the factors of minor importance is increased under the influence of low temperatures.

Fig. 2 shows the relationship between temperature and rail removals better than Fig. 1. The temperature curve has been reversed and the number of rails removed covers those taken out for all four reasons mentioned.

Referring to the table it will be noted that 826 rails had to be taken from track in the five winter months of 1928 and 1929 (December to April, inclusive), owing to cross-section fracture, and 1929 rails for the same months in the following winter. This is an average of 1377 rails put out of service in periods of extremely low temperature. The Tomsk railroad line has about 585,000 rails. Accordingly about 0.23 per cent of the total number are rendered unfit in the winter season.

In further study of the question, an investigation was made of the impact resistance of rail steel at low temperatures. A 10-kgm. Charpy machine was used with notched bars at different temperatures from plus 150 deg. C. (302 deg. F.), to minus 189 deg. C. (308 deg. F.), in liquid air. The work was carried on by Mr. Federov at the Physical Technical Institute in Tomsk. The specimens were 10 x 10 x 100 mm. (about 0.4 x 0.4 x 4 in.) in size, with round notches 2 mm. in diameter. Each specimen was held a few minutes in the liquid cooling medium at a definite temperature, after which it was quickly transferred to the testing machine and broken. The entire operation from the time of taking specimen out of the cooling medium to breaking it in the testing machine was about 5 min. Therefore it may be accepted that the temperature of the specimen was equal to the temperature of the medium with a correctness of 1 to 5 deg. C.

The results of the impact tests are shown in Fig. 3. There is shown a reduction in impact resistance from 4.5 kgm. per sq. cm. at 150 deg. C. (302 deg. F.), to 0.3 kgm. per sq. cm. at —40 deg. C. (—40 deg. F.), and

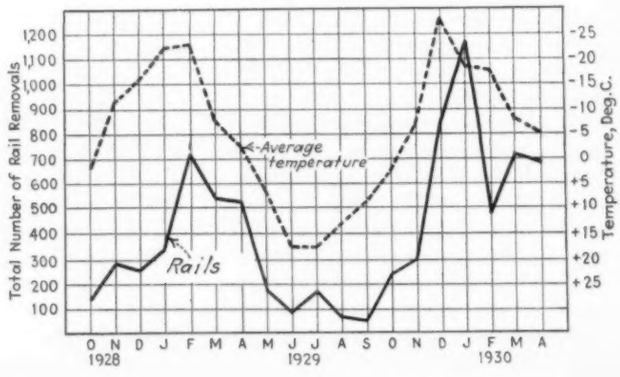


Fig. 2—The parallelism between number of rail removals and temperature is indicated by plotting the temperature figures upside down, and in this graph total rail failures of all descriptions were taken into account.

Low Temperatures ▲ ▲ ▲

RAILROAD experience at Tomsk, Siberia, is that steel fractures have a direct relation to atmospheric temperature, being greater in number the lower the temperature and particularly numerous at bottom levels. Investigations by means of impact tests indicate that minimum resistance to impact is reached at 40 deg. below zero, which is regarded as the critical temperature. Lower temperatures appear to cause no measurable increase in brittleness. Conclusions, fortified by studies at Tomsk and elsewhere, are that for Siberian use either heat-treated carbon steel rails or alloy steel rails are required.

then the strength appears to be approximately constant with the temperature reduced as low as —185 deg. C., (—301 deg. F.) Therefore a critical temperature of —40 deg. C. or —40 deg. F. is shown for the rail steel studied.

The temperature proved to have an effect on the appearance of the surface of the fractures. At low temperatures the surface is flat and crystalline and shines in the rays of reflected light without any signs of permanent deformation. The broken parts may easily be put together again. Fibrous fractures, which are observed chiefly at high temperatures, possess a dull dark color with obvious signs of deformation. The crystals do not have a smooth, glassy plane and ruptures may be observed in the

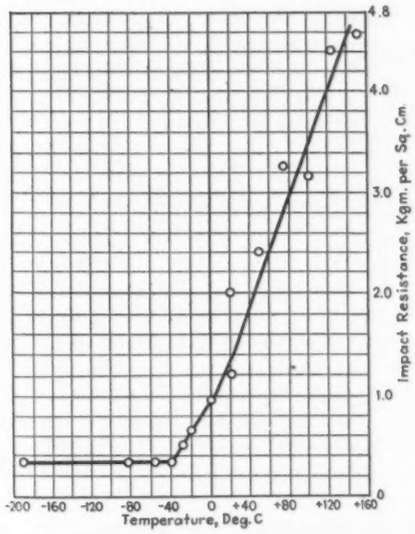


Fig. 3—Impact tests of the rail steel showed reduced strength as temperature dropped until at 40 deg. F. below zero the strength appeared to hold at a substantially constant minimum as the temperature was further reduced.

fibers of the specimen. At the low temperatures, from —185 to zero C., no great difference is noticed in the form of the fractures, whereas at temperatures in the range of zero to 125 deg. C., the fracture acquires a more or less fibrous state.

The physical nature of the brittleness of steels at low temperatures remains undiscovered as yet, but according to the information of the tests it is obvious that low temperatures and not local defects are responsible for the breakage of the large number of rails, tires, axles, etc., reported. Good quality steel free from defects may become brittle and break if the temperature is low.

The supposition that the brittleness of rail steel at low temperatures is owing to the presence of phosphorus remains doubtful, as the phosphorus content of rail steel under the Russian specifications generally varies within restricted limits. For Bessemer rail steel it is not more than 0.07 per cent; for Thomas rail steel, not more than 0.07 per cent, and for open-hearth steel not more than 0.04 per cent. It would be more correct to assume that the allowable content of phosphorus does not affect brittleness at the low temperatures.

An investigation carried out by Prof. A. Dobrovidov in Tomsk helps in a way to solve the problem. The rail steel was subjected to a heat treatment to improve its microstructure, mechanical properties and the Charpy impact resistance. The problem in a word consists in providing the whole section of the rail with a uniform sorbitic structure.

In Fig. 4 is shown the relationship between the testing temperature and the Charpy impact resistance of heat-treated specimens of rail steel containing 0.099 per cent of phosphorus. A similar set of curves for steel containing 0.054 per cent of phosphorus and 0.6 per cent of manganese, showed that the impact resistance of the heat-treated specimens was approximately four times greater than that of the untreated steel at 0 deg. C. and ten times greater at —40 deg. C. (—40 deg. F.) Thus, by treating the rails to produce a sorbitic structure, their impact resistance is improved, the critical temperature of the low-temperature brittleness is lowered, while the Brinell hardness is slightly increased from 190 for the raw rail steel to 210 for the heat-treated steel.

To complete the information reference may be made to investigations of

▲ ▲ ▲

Fig. 4—Impact resistance of rail steel, of 0.099 per cent phosphorus, is improved by heat treatment as follows:

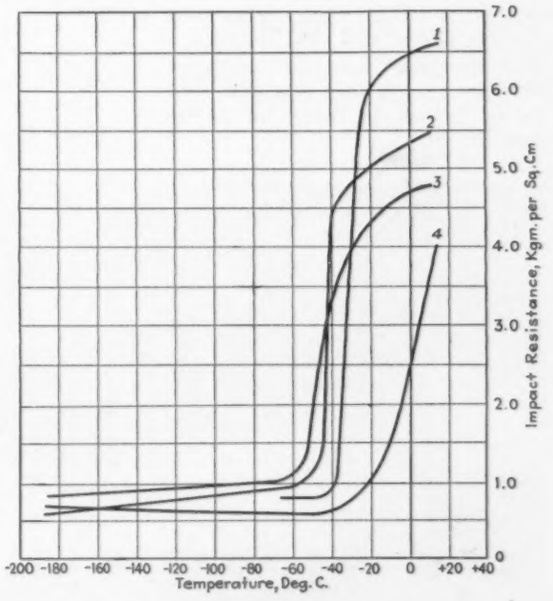
Curve 1, quenched from 740 deg. C. in oil, drawn at 640 deg. for 2 hr., with Charpy impact value at 0 deg. C. 6.0 kgm. per sq. cm.

Curve 2, quenched from 840 deg. C., drawn at 640 deg. for 4 hr., with impact value at 0 deg., 5.3 kgm. per sq. cm.

Curve 3, quenched from 840 deg. C., drawn at 640 deg. for 2 hr., with impact value at 0 deg., of 4.8 kgm. per sq. cm.

Curve 4, raw specimen without heat treatment, Charpy impact at 0 deg., 2.5 kgm. per sq. cm.

▼ ▼ ▼



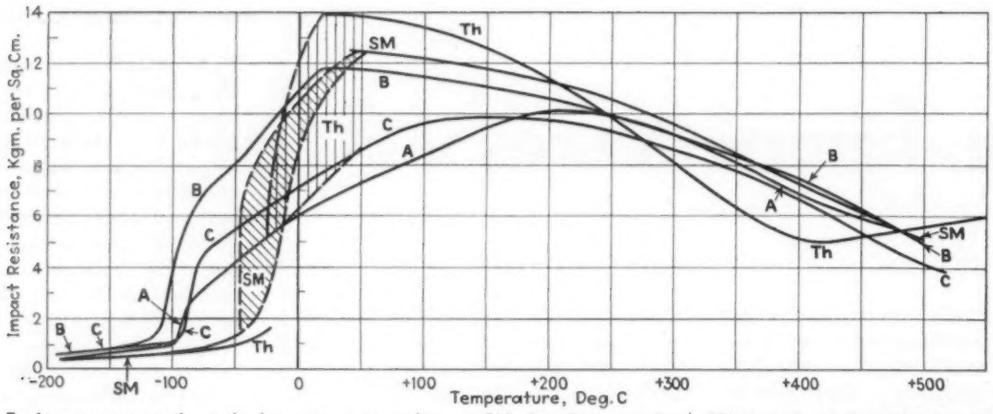


Fig. 5—Impact tests made at Aachen over a range from —310 deg. F. to nearly + 950 deg. F. of the following steels:

	C %	Si %	Mn %	P %	S %	Cu %	Cr %	Annealing Temp. deg. C.
Basic Bessemer (Th)	0.04	0.01	0.37	0.066	0.046	0.09	...	930, cooled in air
Open-hearth (SM) ..	0.15	0.01	0.57	0.024	0.030	0.18	...	930, cooled in air
Silicon steel (A) ...	0.15	0.89	1.12	0.053	0.036	0.10	...	850, cooled in furnace
Union Hau (B)	0.15	0.36	0.87	0.022	0.026	0.85	0.51	850, cooled in furnace
Cu-Mn-Si steel (C).	0.19	0.50	1.09	0.016	0.025	0.60	...	850, cooled in furnace

Prof. F. Rotscher and Dr. Ing. M. Fink at the Technical High School at Aachen. Fig. 5 shows results of impact tests on five different steels at temperatures from —190 deg. C. (—310 deg. F.), to 500 deg. C. (932 deg. F.). The parts of the curves for the lower temperatures, from zero to —190 deg. C., show that the Bessemer Thomas steel and the open-hearth steel possess a lower Charpy value than the alloy steels of the grades A, B and C.

Rail Removals from Tomsk Railroad Track Owing to "Cross-section" Fractures

	Types of Rails				Atmospheric Temperature		
	III and IIIa	65 lb. per yard	48½ lb. per yd.	Total	Max. deg. F.	Min. deg. F.	Average deg. F.
Oct., 1928	13	7	5	25	+77.2	— 5.1	+37.9
Nov.	22	16	3	41	+41.5	—18.8	+11.7
Dec.	33	37	16	86	+25.9	—43.8	+ 4.1
Jan., 1929	76	56	16	148	+16.2	—41.4	— 8.1
Feb.	198	149	49	396	+20.8	—43.4	— 9.2
March	88	61	35	184	+45.3	—14.1	+18.1
April	64	19	29	112	+70.8	+16.3	+27.0
May	21	6	6	33	+74.3	+27.1	+43.2
June	7	3	8	18	+86.9	+41.0	+64.0
July	8	3	2	13	+86.5	+42.3	+64.2
Aug.	11	2	1	14	+84.4	+34.0	+56.8
Sept.	11	1	2	14	+75.7	+29.7	+48.7
Oct.	16	21	7	44	+59.0	+10.1	+36.1
Nov.	34	15	17	66	+37.7	—31.7	+19.8
Dec.	355	117	69	541	+15.1	—54.2	—18.0
Jan., 1930	545	248	25	818	+24.3	—52.8	— 0.9
Feb.	147	71	20	238	+25.3	—31.5	— 0.4
March	148	75	13	236	+40.1	—39.8	+18.0
April	56	25	15	96	+51.8	—17.1	+23.0

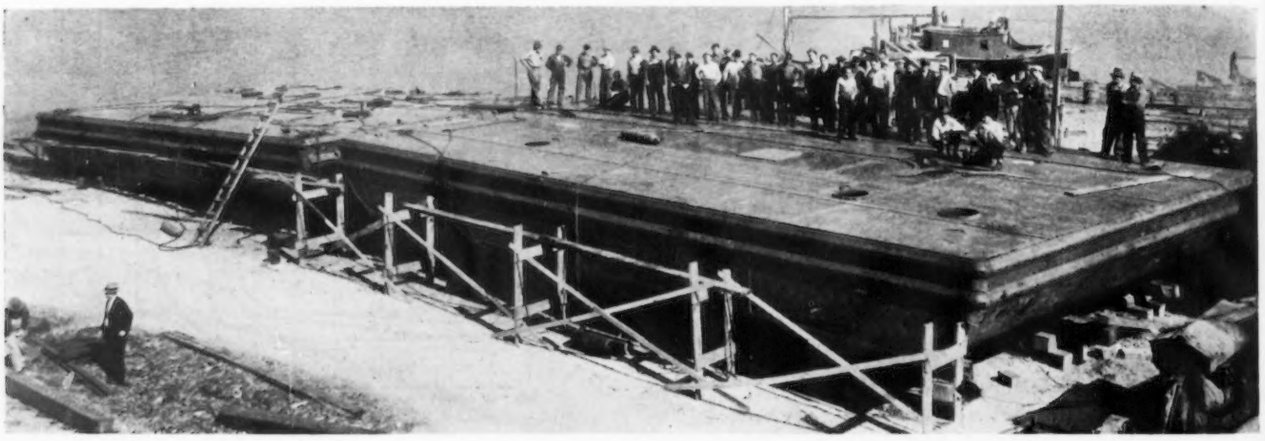
Need for Heat Treatment or Alloying

Grade B steel appears to have a special advantage and one draws the conclusion that neither the basic Bessemer nor the open-hearth steel process is capable of imparting a high impact resistance at low temperature and therefore is not suitable for railroad rails in Siberia. The final conclusion is that the rail problem requires either proper heat treatment of carbon rail steel or the use of suitable alloys for rails.

Barges Built in Record Time by Arc Welding

STEEL plate plus welding equipment plus 40 men plus two weeks equals two 60 ft. barges in Galveston, Texas.

This is believed to be a record speed for barge construction. It was made by the Kane Boiler Works, Galveston, on barges built for the United Dredging Co. of New York. The barges are 60 ft. long, 30 ft. wide and 6 ft. deep. Forty welding operators were employed. All welding was done by the shielded arc process using Fleetweld electrodes and machines manufactured by The Lincoln Electric Co., Cleveland. Upon completion of the barges, they were tested without a single leak appearing.



Lubrication of Rolling Mill Gear Units

LUBRICATION of rolling mill reduction gear units was discussed by Thomas Holloway, gear consultant, United Engineering & Foundry Co., Pittsburgh, before the annual meeting of the Association of Iron and Steel Electrical Engineers. His address as a whole was devoted to the design of the gear units, and in THE IRON AGE of Jan. 25, his contribution on the gear question was reviewed at some length. In the following is outlined what he had to say on lubrication.

IT was common practice up to about 1929 to 1930 to specify a good grade of mineral oil (about 2100 Saybolt at 100 deg. F.) for large mill drives and a lighter grade for the bearings; the splash and ring oiling bearing system was most common.

There are certainly hundreds of these drives still operating satisfactorily and it is, therefore, an open question as to whether extreme pressure lubricants are of any considerable advantage on the majority of drives which are properly designed with correct materials and normal pressures, although there is a gain where excessive tooth pressures exist. This condition is much better avoided, however, and it can generally be effected if sufficient care is taken in proportioning gears and in selecting materials.

Case of Extreme Pressure Lubricants

It is interesting to note that extreme pressure lubricants became prominent at the time gear pressures on back axle gears were increased from 1200 to 1850 lb. per in. of face and that so long as the extreme pressure lubricants were used the teeth apparently did not cut, but when ordinary service station grease was used the gears failed. It is even more interesting to note the behavior of a pair of mill gears at about the same time. These gears were made of alloy and carbon steels of about 36 scleroscope hardness and even though the heaviest grade of extreme pressure lubricant was used they scored and cut under the extreme service to which they were subjected. They were then re-cut and hardened to about 75 scleroscope, and placed back into service with the same lubricant. The teeth are now polished and look good for indefinite service.

It would seem, therefore, that while there are undoubtedly differences in the quality of lubricants, there is not at present sufficient accurate information available so that results can be predicted, and that the best policy of the designer is to so proportion each set of gears that with the use of ordinary lubricants of reasonable cost they will operate satisfactorily.

The best lubrication system is the simplest that can be used successfully. For units with moderate pressures and of such proportions that the splash and flood system is practicable, this is the best to use. The same oil is used for bearings and gears and is continuously circulated by splash and gravity. With proper baffles and dust rings the loss is very slight and a filter unnecessary. Such drives should operate without attention for months.

Drives with gears under heavy pressure or of such ratio that the splash is insufficient to flood the bearings should be designed for splash for the gears and ring oiling from separate reservoirs for the bearings but where the peripheral speed is 2000 ft. or over forced feed to the bearings and sprays to the gear teeth should be employed.

Central Lubricating Systems

In the case of the drive for a roughing stand of a continuous strip mill, the lubricating system is designed for separate lubricants for bearings and gears. The drive is one of ten of similar size connected to a central system containing about 4000 gal. of gear lubricant and about 500 gal. of bearing lubricant; the whole system is filtered by centrifugal filters. From latest information received, the separation of the lubricant is so successful that out of all this continuous circulation of over 4000 gal. of oil, during a period of 24 hr., there is a maximum of two pails of foreign matter recovered from the filters. This foreign matter will include some of the heavy lubricant filler, some foreign

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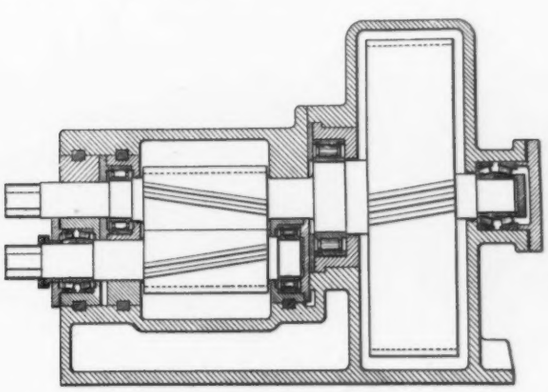


Fig. 1—By a staggered arrangement roller bearings were applied to the pinion stand for a four-high mill.

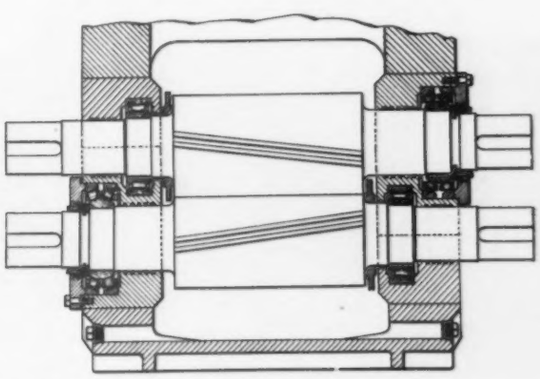


Fig. 2—A combination pinion stand and main drive were equipped with roller bearings by a development of the staggered principle.

Causes of Porosity in

By J. H. CHEETHAM
Factory Manzger, Chance Co., Centralia, Mo.

THE author's experience and research work in non-ferrous fields with some of the largest valve, engineering specialties and plumbing goods companies show that the foundry foreman's chief worry is how to reduce losses of castings through porosity. This applies to castings for pressure work of regular run of non-ferrous castings, especially when the products are to be nickel or chromium plated. Defects are often found after being chromium plated which are not discovered even after polishing and the castings have to be scrapped. This is very costly, as all the foundry, machine, polishing and plating work is lost.

Articles in technical magazines tell what the trouble is and how to find it, but they do not say how to get rid of it. It was this fact that led the author to work out a system to help foundrymen in this particular. The practice hereinafter outlined has been installed by some leading companies and when followed closely has resulted in success. The practice eliminates the cut and try method. It can hold the total foundry and shop scrap, due to foundry faults, below 5 per cent.

Foundry scrap has always been a problem and of late years keen competition has demanded that economy be practiced more than ever. Manufacturers have come to realize that losses incurred through foundry scrap often exceed their profits. These facts have created a demand for trained foundry engineers, who have proved to be such a profitable asset that colleges have started, within the last few years, to formulate and specialize on foundry engineering courses.

The day is past when foundrymen doctor metal with elements from their vest pockets and personally see that they put the magic touch to every pot of metal poured. The juggler is being replaced by an engineer who, in order to be efficient, must order his raw materials by specification and see that they are received accordingly. He must standardize on processes which involve much test and research work before being adopted. He must then formulate from his processes standard practices for every person's work and see that they are as near fool-proof as is practically possible. To do this he must absolutely know how to gain the respect of the company and of the men who follow his instructions. Last, but not least, he must exercise constant vigilance over these processes and standard practices; he must police each phase of the business and see that none "rest on their oars" or slacken up, as the wrong core sand or oil will mean loss in cores, loss in molding, melting, cleaning, and so on down the line, until the cost has lost the company all its profit and maybe more.

Six Groups of Melting Fluxes

The writer has found that the melting of metal is one of the most important duties of the foundry division. It is a well known fact that all metals have an affinity for foreign elements which have to be removed or counteracted by metallic and non-metallic elements commonly called fluxes. Melting fluxes are used alone or compounded for several purposes, some of which, to coin a few words, are:

1. Deoxidizing
2. Degasifying
3. Densifying
4. Purifying
5. Fluidizing
6. Hardening

As there is no cure-all flux, it is necessary to consider each item, i. e., the type of melting furnace, fuel, metal mixture, class and quality of metals used, before judging the proper flux to use. One hears a great deal about oxidized metal, porous castings, etc., but it is a question if many foremen can tell by looking at castings or even by the results of fracture, physical test bars, etc., what the trouble is or whether the metal needs purifier, deoxidizer, or strengthener.

The following general rules will apply:

Small shiny specks (round pin holes) on surface, generally appearing in cope side collectively or a large shiny cavity with small ones around it in cope or drag after skin of casting is removed, are due to gas caused by mechanical faults. This is called porosity and the metal needs degasifying.

Various colors in fracture, small irregular specks of metal or oxide separately distributed, which show up when buffed and polished, indicate a chemical fault. These imperfections may be detected on the surface in cope or drag, in fracture, or from leaky castings during test. They are due to oxides which are generally in the

Fig. 1—Copper oxide inclusions, black (CuO) or red (Cu_2O); magnification 100 times; not etched.

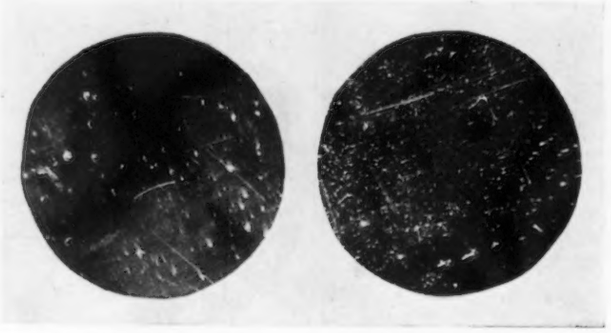


Fig. 2—85-4-5-6 mixture; porosity from H_2O gas; magnification 100, unetched.

Fig. 3—85-4-5-6 mixture; porosity from SO_2 or CO caused by reducing flame (excess oil); magnification, 100 diameters, unetched.

Non-ferrous Castings

CAUSES of faulty brass, bronze and other non-ferrous castings are detailed in the accompanying article. Two articles to follow will list preventives. Mr. Cheetham in THE IRON AGE of Dec. 7, 14 and 21, last year, drew from his experience on a totally different subject, namely, piston rings, telling the requirements they must meet and how they are cast and machined to satisfy those needs.

metal before using, or to improper alloying or improper melting. This is called oxidized metal. Rotten castings or leaky castings are sometimes caused by shrinks and draws resulting from improper design or gating. The cause can readily be determined.

When metal of mixtures that should give strength is weak in strength and elasticity the cause is the result of improper alloying or improper furnace working. The fracture will often show the elements are properly amalgamated and the metal can often be remedied by a flux to purify the metal or by adding an element to increase its density.

Oxidized Metal

Oxidized metal is mostly a chemical trouble resulting mainly from the use of poor materials. Oxidized metal shows up in castings as a eutectic segregation giving low tensile strength and leaky castings. Any metal will oxidize more readily at a high temperature or by improper timing of oxidizing flame or reducing flame during the melting process. To deoxidize metal is to remove combined oxygen or metallic oxides which are already in the metal or formed by the absorption of oxygen by the metal during high temperature melting process. It is mainly eliminated by careful furnace work and proper fluxes.

Gasified Metal

Gasified metal is mostly caused by mechanical trouble, such as improper furnace work, pouring, or mold conditions and causes porousness (pin holes), cavities, and sponginess. Excessive heating or soaking of metal in the furnace is the main cause for absorption of gases. To degasify metal is mainly to remove oxygen, sulphur dioxide, or carbon dioxide. All metals take up a certain amount of oxygen which unites freely with common metals, especially copper, and forms deleterious gases. If the molten metal comes in contact with coal, coke, or high sulphur content oil, it will absorb a certain percentage of sulphur in the form of sulphur dioxide gas. If a reducing flame is used (caused by an excess of oil), the metal will absorb carbon from the oil, and form "oil clinkers." These gases are dissolved while the metal is in its molten state and are generally liberated while the casting is cooling. If metal is poured too cold, the casting will be complete but after the skin is taken off, it shows large shiny holes about the size of a pin head at the end opposite the gate. This is due to metal being too sluggish to liberate the oxygen absorbed while melting or during the pouring process.

To Increase Density

Eutectic segregation generally means an oxide film in the void space around the crystals. Being nonmetallic it allows under pressure for leaks through the metal or shows a low tensile strength and low elastic limit. Metal crystals of various elements cement together and the alloy of the cement is stronger than the pure element, hence the reason that fractures show true crystal effects. It is when this cement is ruined by heat or foreign elements that so-called eutectic segregation occurs. To render metal dense is to counteract separation of the metals. Sometimes a space is left between the crystals which shows up as a spongy casting. This condition is prevalent in all copper base mixtures through certain

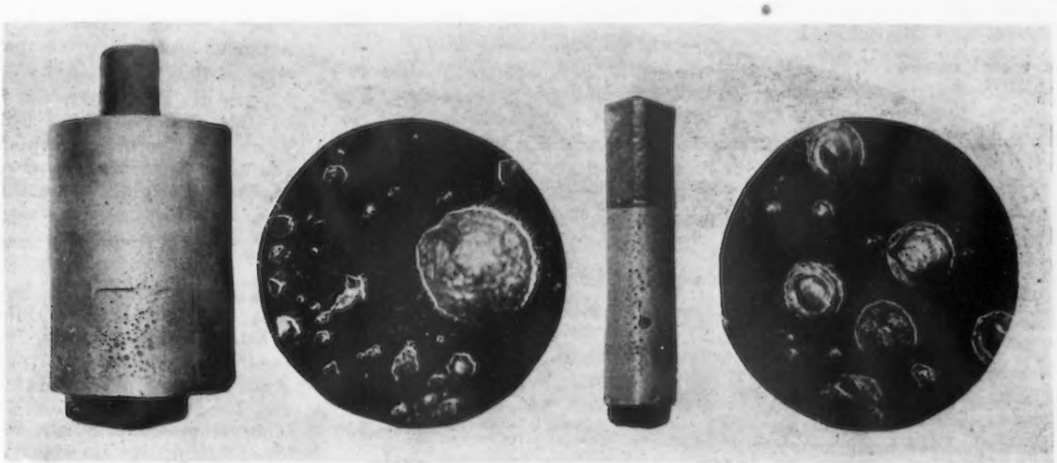


Fig. 4—Snap shot of actual casting poured at high temperature, 2250 deg., and moderate per cent moisture in mold.

Fig. 5—Large air pocket of H_2O gas; small of H_2O gas or CO; magnification 100 from Fig. 4; unetched.

Fig. 6—Snap shot of ground key stop key showing effect of steam caused by wet molding sand.

Fig. 7—Porosity and gas inclusions of H_2O and O; magnification 100 of Fig. 6; unetched.

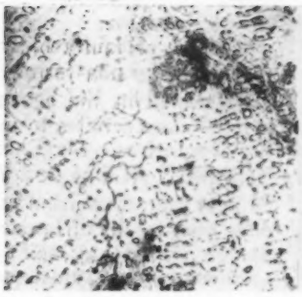


Fig. 8—85-4-5-6 mixture; eutectic segregation, coarse crystals; dark spots are lead segregation containing aluminum; magnification 100; etched with H_2O_2 and NH_4OH.

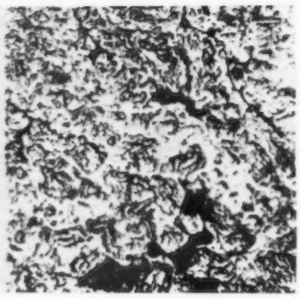


Fig. 9—85-4-5-6 mixture; eutectic segregation, coarse crystals; magnification 100; etched with 10 per cent H_2SO_4 in H_2CO_4.

factors, such as the presence of aluminum, iron, excessive lead or phosphorus, or combinations of elements such as silicon and lead.

Purifying Metal

Impure metal is known as metal which has certain elements segregated and not thoroughly amalgamated or metal contaminated with undesirable elements which are detrimental for the purpose intended. To purify metal is to remove detrimental elements which interfere with the physical requirements, such as high conductivity or minimum resistance to electric current. Metal is often doctored by the addition of foreign elements to make it homogeneous and dense or to remove occlusion of gases absorbed during the melting or in the mold. When metal is not properly treated, it often results in making matters worse in that it gives an "off mixture," eutectic segregation (see Figs. 8 and 9) and, in the case of electrical copper, it reduces the conductivity to such an extent that it makes the material practically useless.

Promoting Fluidity

Sluggish metal causes dirty castings, mis-runs, and often segregation of the elements. To "fluidize" metal is most desirable to the general foundryman and is accomplished by the addition of elements which thin or agitate the metal to bring impurities to the surface to be skimmed off. The benefits gained by making the metal increasingly fluid often leads to an overdose, which is more detrimental than the good obtained.

Hardening Metal

Some alloys are often too soft for their proper uses. To eliminate excessive wear in frictional applications, it is necessary to add one or more elements to increase the hardness and close the grains. To increase the hardness naturally means to increase the density, but the density can be increased often and not the hardness.

Fluxes

Having stated the shortcomings of non-ferrous castings and their causes, it is now necessary to point out how to eliminate them, as by fluxes or counteracting agents. The foundryman, in trying to reduce losses, has been somewhat like a drowing man in grasping at each straw to save himself, only to sink deeper. By his constant grasping he has encouraged a flooding of the market with fluxes claimed to do wonders. It remains that some of the fluxes are very effective, and in order to condense the subject for practical reference, the author has covered some of the most popular and effective remedies to eliminate each of the mentioned troubles. Some flux combinations of silicons, calciums, sodiums, etc., are omitted because of their impracticability; some owing to high cost and others because of a more effective available element.

A few of the flux elements and general uses are shown in the table below.

	Melt. Temp., Deg. F.
Phosphorus—fluidizer, purifier, deoxidizer, degasifier	110
Boron—purifier, deoxidizer	3632–4500
Aluminum—fluidizer	1217
Copper oxide—purifier	1947
Nickel—purifier, densifier, strengthener, hardener	2646
Zinc—purifier, deoxidizer, degasifier	786
Manganese—hardener, strengthener, purifier, deoxidizer, densifier	2237
Magnesium—hardener, degasifier	1204
Silicon—purifier, hardener, deoxidizer, degasifier	2588
Sodium carbonate (soda ash)—deoxidizer, purifier	1564
Sodium borate (borax)—Deoxidizer, degasifier	1366
Sodium chloride (salt)—purifier, deoxidizer, degasifier	1481
Charcoal—purifier, deoxidizer, degasifier	Decomposes
Iron—hardener, densifier	2768
Copper—hardener	1982
Silica (sand)—purifier	2500
Calcium hydroxide (slack lime—purifier, deoxidizer	3623
Calcium sulphate (plaster of Paris)—purifier, deoxidizer	2480
Barium sulphate—purifier, deoxidizer	1562
Glass—deoxodizer	1300–1400
Ammonium chloride (salammoniac)—fluidizer, deoxodizer, degasifier	Decomposes
Zinc chloride—fluidizer, deoxodizer, degasifier	689
Bicarbonate of soda (baking powder)	....

In two additional articles the author will describe the ways to cure the diseases of non-ferrous castings.

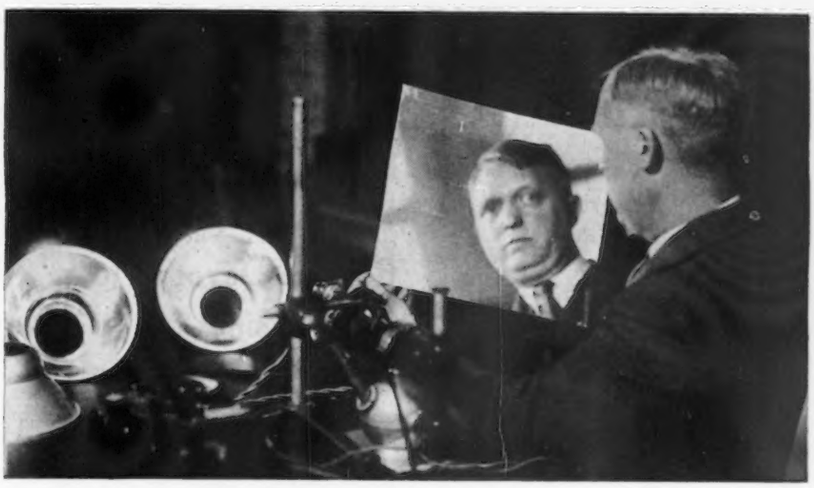
Research on Enameling At Mellon Institute

DR. EDWARD R. WEIDLEIN, director, Mellon Institute of Industrial Research, Pittsburgh, Pa., has announced that the O. Hommel Co., of Pittsburgh, has founded an industrial fellowship in the Institute for the purpose of conducting scientific research on problems of enamel technology. In particular, it is expected that this Fellowship will acquire technical information, through its investigations in the laboratory and in plants, supplemented by the experience of specialists in the Hommel and cooperating organizations, including Enamelers' Guild, of Pittsburgh, that will enable it to serve as a clearing-house of dependable facts regarding frits and their industrial use. Research of the fellowship will be published for the benefit of enamelers; and advice and information on enameling, and assistance in solving plant problems and in making evaluations or other practical tests of frits, will be extended gratis to companies that wish such technical aid.

Jack H. Waggoner, the incumbent of this fellowship, has been professionally active in the ceramic field for the past thirteen years as a chemical engineer and glass technologist.

A copy of the 1934 issue of the Year Book and Code Guide of the Waste Material Dealers, Inc., can be secured by addressing the National Association of Waste Material Dealers, Inc., Times Building, New York. The volume contains the recently revised commodity classifications, trade customs affecting the industry, arbitration rules, and information regarding foreign trade. The code of fair competition of the waste material trade and all related codes are also included.

Aluminum for Reflectors



Dr. R. B. Mason, discoverer of the method of obtaining the improved reflecting surface, viewing his own reflection in an Alray surface.

ALUMINUM is a naturally bright metal and has long been used for reflectors. The usual commercial practice has been to finish and brighten the surface by polishing or by etching. With polished aluminum reflectors, a reflection factor of 65 to 75 per cent has usually been obtained.

Commercially pure aluminum of the type commonly used for reflectors is too soft to lend itself to the attainment of greater brightness by commercial polishing methods. Polishing, of course, gives a specular or mirror-like reflecting surface. In many cases, as, for example, in lighting equipment or with ultraviolet lamps used for therapeutic purposes, a diffusely reflecting suface is desirable, and this is readily obtained by etching processes. This etching brightens the metal and at the same time roughens the surface so as to give it the desirable light-diffusing characteristics.

Surface Staining Was the Problem

The practical disadvantage of reflectors finished in either of these ways is their liability to surface staining when exposed to the weather or the difficulty of cleaning if dirt is allowed to accumulate on the reflecting surfaces.

The problem requiring solution was to give aluminum reflectors the brightness which the metal intrinsically possesses and then to provide this brightened reflector with a transparent coating which would protect it during service. Great progress has been made in the last two years in the protection of aluminum by electrolytic or anodic oxidation. This process produces a hard, abrasion-resistant oxide coating on the metal. When applied to reflectors, however, the first result was a marked decrease in reflectivity, amounting to about 10 to 20 per cent. The oxide coating left the metal with a rather opaque and milky surface finish which markedly detracted from its value as a reflector. It was found that this loss in brightness resulted from the presence of impurities, partly metallic and partly non-metallic in character, on the surface of the aluminum.

In seeking for improved reflecting surfaces, Dr. Mason discovered a new type of anodic treatment which brightened instead of dulled the aluminum. Neither did it injure the specular characteristics of the surface. As a result of his investigations, it is now possible to take a highly polished aluminum surface and by the application of what he calls the "electrolytic brightening process," increase its reflectivity, leaving on the surface at the same time a very thin protecting oxide film. To prove his point, Dr. Mason took an aluminum reflector having a reflectivity of 74 per cent, subjected it to the electrolytic brightening process, and gave it a subsequent reflectivity of 87 per cent without any roughening of the surface.

A further fortunate advantage of the process was that a heavier protective oxide coating could be produced after the electrolytic brightening step by a second anodic process and without any substantial loss in reflectivity. This was done by means of the Alumilite process.

This process, well adapted for this purpose, is a means of anodically coating aluminum in electrolytes of patented composition. The electrolytic brightening treatment appears to remove impurities from the surface of the metal. After the brightening treatment, the Alumilite process can be further employed to oxidize the surface electrolytically.

Coating Sealed Against Corrosion

As a final step in producing a finished reflector the oxide coating is sealed by a special process to make it impervious to corrosive influences. The sealing converts a porous, moisture-adsorptive coating into an impervious non-moisture-adsorptive coating. Stains cannot, therefore, mar the coating and its general serviceability is increased. The name "Alray"

THE discovery of a new type of reflecting surface with a base of aluminum was announced at a meeting of the Illuminating Engineering Society, held in Cleveland on Jan. 22. Aluminum finished by the new process has a reflectivity as high as 85 per cent—not far below that of silver. It has the outstanding advantage, from the commercial standpoint, of not tarnishing in industrial atmospheres, of being resistant to weather, and of being readily cleaned by washing with soap and water.

Papers on the subject were read by Messrs. A. B. Oday and A. F. Dickerson, of the General Electric Co., and by Mr. J. D. Edwards, assistant director of research of the Aluminum Co. of America, New Kensington, Pa.

The discovery of the improved reflecting surface was made by Dr. R. B. Mason, of Aluminum Research Laboratories.

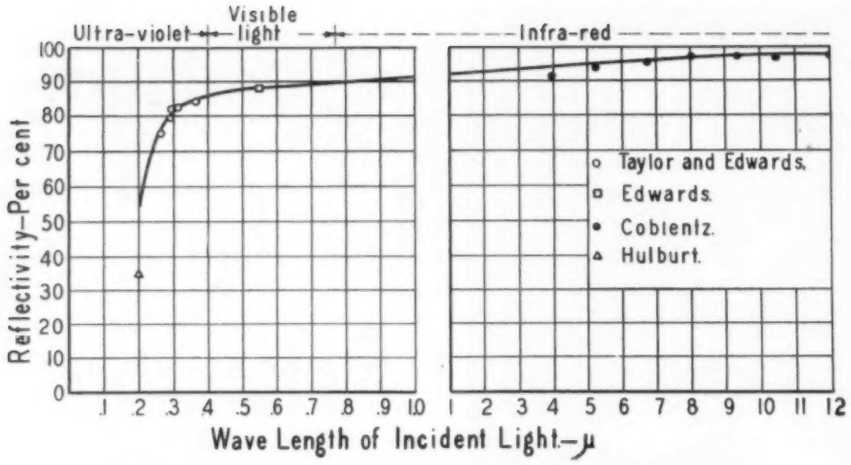


Fig. 1—Reflectivity of aluminum in the various ranges of the spectrum.

has been given to reflectors made by this process.

The development of such a highly reflecting surface will find new avenues of usefulness for aluminum. The electrolytic brightening treatment will give added luster and life to flood lights and lighting fixtures, and aluminum so treated can be used in pocket mirrors, table ornaments, decorative accents of store fronts, and many other applications. The General Electric Co. proposes the Alray reflector for lighting bill boards, service stations, building tops, fountains and statuary. This reflector, because of its protective coating, resists marking by handling and is impervious to ordinarily corrosive conditions such as weather exposure. The surfaces of Alray reflectors are smooth and glassy, do not collect dirt, and can be readily cleaned by washing with soap and water. If more drastic cleaning methods are necessary, a mild abrasive can be effectively employed.

Data collected from various sources have been assembled in Fig. 1 to show the reflectivity of aluminum in the ultraviolet, visible, and infra-red portions of the spectrum. Aluminum has high reflectivity in the ultraviolet region and makes the best reflector for sun-ray lamps and other ultraviolet lamp equipment. The excellent reflecting power of aluminum for visible light has already received comment. The very high reflectivity (low emissivity) of aluminum for infra-red or heat radiation is effectively made use of in the Alfol type of insulation, which employs bright aluminum foil layers separated by thin air spaces. The high reflectivity of aluminum in all three ranges of the spectrum makes it a universal reflecting metal.

In Fig. 2 there is shown a photomicrograph (at 500 diameters) of a section through an Alray reflector. The transparent oxide film is scarcely visible on the reflector but its reality is demonstrated by the photomicrograph where it shows a thin dark band on the surface of the aluminum.

The weather resistance of the finish on the Alray reflectors is best illustrated by a test in which an Alray reflector was exposed to the weather for more than seven months on the roof of Aluminum Research Laboratories in New Kensington, Pa. The reflector was taken in and cleaned from time to time and its reflectivity measured with the Taylor reflectometer. When originally made, the reflector had a reflectivity of 84 per cent, and at the end of seven months this value had not decreased, even though there was some slight scratching of the surface, owing to the washing off of accumulated grit during periodic cleanings.

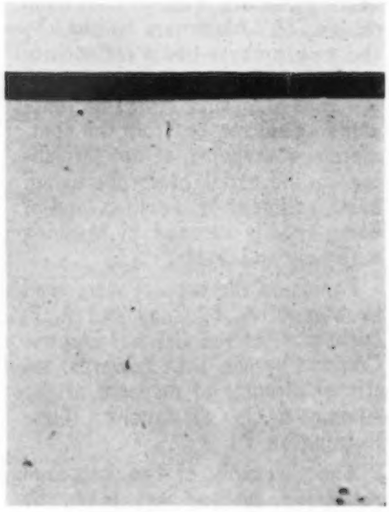


Fig. 2—Photomicrograph of section through reflecting surface, showing the transparent oxide film as a thin, dark band on the surface of the aluminum. (500 diameters).

Besides the uses mentioned above, the Alray finish should have extensive applications in other fields. It has high reflectivity in both specular and diffuse reflectors combined with a hard, clear, glass-like coating of oxide which protects it against deterioration.

Booklet Devoted to Hard Facing

ECONOMIES and procedure in hard facing, as well as a large number of typical applications, are outlined in a highly instructive 95-page booklet on "Hard Facing with Haynes Stellite Products," issued by the Haynes Stellite Co., 30 East Forty-second Street, New York.

Hard facing is the process of welding on to new or worn wearing parts a coating, edge, or point of a metal that is highly resistant to abrasion. Cost reducing features summarized in the booklet include: Longer life of equipment; fewer replacements, with resultant savings in labor charges and lost production time; utilization of cheaper base metal for wearing parts; and the salvaging or reclaiming of worn parts.

More than two-thirds of the booklet is devoted to actual applications in some 15 different industries, including agricultural implement, automotive, coke and gas, excavating, cement, iron and steel, machinery and mining. Illustrations are numerous, and in all cases the advantage of the hard facing, as in prolonging the life of the part, etc., is cited.

Applications in the iron and steel industry include electric mud guns, tap hole augers, skulling hooks, charging rams, gag press hammers, shear blades, punches, spindles, guides, conveyor rolls and bearings and shear clutches. In coke and gas plants, hard facing of pokers, pusher shoes, carbon scrapers and pulverizing hammers and other parts are shown. Mining equipment applications include crusher jaws, scraper blades, hand shovels, buckets, drill bits, skip guides and belt clips. In the machinery section, illustrations show hard-faced dies, cams, shear blades, collets, centers, ejector pins, wire guides and other parts. Automotive applications include valve seats, burnishing broaches, truck and bus parts, airplane tail skids and tire chains.

An important section of the book is that devoted to hard facing procedure, both by the oxy-acetylene and electric arc processes. The properties, available forms, and other data relating to Haynes Stellite, Hascrome, Haystellite, Haystellite composite rod, and the Hastelloys are also included. The booklet is attractively arranged and is thoroughly indexed for ready reference.

Inception and Development of Hard Metal Carbides

By KARL SCHROETER

DURING the past few years industrial inventions have resulted less and less from inspiration, a sudden fortunate idea, or even from chance. New industrial methods are usually discovered only after the expenditure of great effort and the application of every investigative faculty.

Hard metal carbide is no child of chance, and as sintered tungsten carbide with additions of cobalt it has undergone an unprecedented development in the United States, enriching many branches of industry. Sintered carbide can be characterized as a child of the World War, even if this is only indirectly correct. During the war there arose in the operation in which I was engaged the necessity of finding a suitable substitute for the diamonds which were used as dies for the drawing of tungsten wire. The drawing of tungsten wire makes about the greatest mechanical demands upon the drawing blocks that are to be found in practice, as the strength of the wire in the case of small diameters becomes as great as that of steel wire and the surface is already relatively very hard.

The diamond process of producing tungsten wires for lamp filaments originated in the United States and resulted in a large consumption of diamonds. In order to avoid this, I was authorized to seek a substitute. It was only natural that the first experiments should be made with a tungsten product, tungsten carbide, already known to be hard. A vacuum arc-smelting furnace was constructed in quite a primitive manner, and in this, small pieces of tungsten carbide were melted. Likewise, pieces of pressed powder were sintered just below the melting point in a carbon tube furnace. Very soon it was found that these products were very hard, but they were also extremely brittle. Moreover, graduations of the cooling speeds and numerous other variations which were tried caused no change in the characteristics of the product. To be sure, success was occasionally achieved in drawing great amounts of tungsten wire through drawing blocks produced from these products, but there always came a time when the block cracked.

Observation showed this was mostly the case when any drawing of the wire took place unevenly. Apparently the pure tungsten carbide was not able to cope with sudden violent demands on its impact resistance. In the case of drawing blocks produced by sintering just below the melting point, it was possible to eliminate these difficulties by employing a low melting metallic matrix to impart to the blocks a yielding tendency, without, however, influencing their hardness. Resort to this method had the following additional advantage—the temperature at which good sintering resulted was considerably lower, if the admixed auxiliary metal was present, than when only pure tungsten carbide was heated. We were, therefore, dealing with a condition which was to be compared, at least superficially, with the known lowering of the melting temperature of certain alloys that results from additions of other elements. In the course of these experiments it was finally found that the sintered products were far superior to melted ones, and that there are certain metals or groups of metals which, besides appreciably lowering the sintering temperature, also impart to the material the desired tenacity in an extraordinary and successful manner. The material finally developed was a hard product capable of coping with every sudden and violent demand. It was soon evident that this product was not only suited for its original wire-drawing purpose, but, beyond this, could be used generally as a machining tool. The efficiencies which were attained exceeded those known previously even for the best cutting tools.

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WHEN the Krupp Steel Works marketed Widia in 1926 many American manufacturers immediately tooled-up their machines with the revolutionary product and increased production efficiencies more than 100 per cent. Since that time much has been written regarding sintered or cemented tungsten carbides, but the accompanying dissertation by Mr. Schroeter for THE IRON AGE is particularly attractive, as it constitutes an authentic history by the patentee of the original basic principles. This will be followed by articles dealing with the theory underlying the production of sintered carbide and its applications in machining.

Karl Schroeter was born at Cork, Ireland, in 1885, and while working for Osram Gesellschaft in 1914 conceived the method of using cobalt for toughening Moissan's tungsten carbide. The initial Hartmetall was further improved by Schroeter and associates, and the final product Widia (wie diamant) was greatly responsible for Germany's war and post-war engineering stamina. After 1926, American rights were given to Firth-Sterling Steel Co., Carboloy Co., and Ludlum Steel Co., and their products rapidly gained favor for the machining of soft but abrasive materials, alloys, and glass, because of their ability to retain a good edge over long periods of time and under very severe cutting conditions.

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Examination of Products

During systematic experiments, which were conducted in the years 1918 to 1923, it was not possible to subject every laboratory product to a practical test. Moreover, ways and means had to be found which were quicker, simpler, and, consequently,

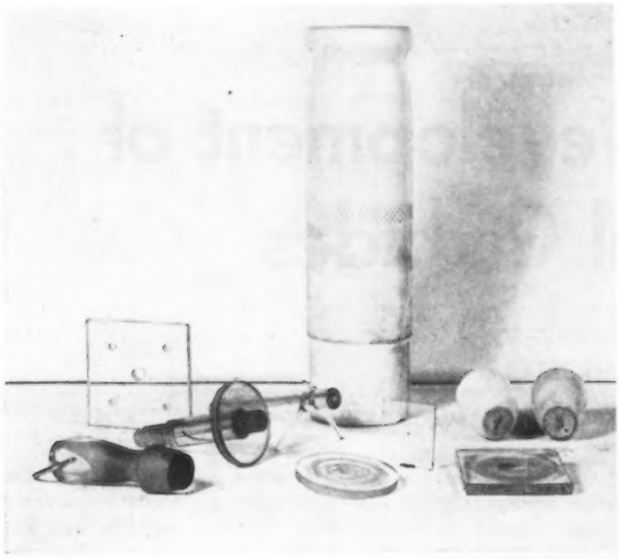

Fig. 1 — Illustrating the diverse machining operations made possible by the use of hard metal tools. The view shows bored and milled glass plates, pierced porcelain crucibles, and a highly burned porcelain insulator turned off.

tory product produced at the time, from which it was possible very soon to characterize it as promising success, or discard it as unpromising. *The final judgment would, however, always have to be reserved for the practical operating experiment* — either the drawing experiment on the drawing bench or the cutting experiment on the lathe. These methods have been recently supplemented by the Röntgenographic (X-ray) method, which is especially useful in examining the interior structure.

The systematic use of these methods in the last decade has led to the evolution of products which brought about revolutionary changes in large-scale manufacturing in both the old and new worlds. The first products I developed were exhibited by the Krupp firm at the Leipzig Spring Fair of 1927. Since then the experiments of numerous experienced men and scientists have led to further development of the fundamental idea of adapting the material to all possible special purposes, for which, as originally developed, it could not be used with maximum efficiency.

less expensive. One of these means was the chemical examination of the completed product, although, naturally, accurately measured amounts of the initial substances were used. The composition of the final product quite often was different from the original analysis, especially in carbon content. Another method was the examination of the structure; the porosity could easily be determined by means of an inked line. Really satisfactory examination, however, implied the use of a microscope on a ground surface polished to a high luster. The grinding and polishing work had to be carried out with diamond dust because of the great hardness of the experimental materials. After some experience, the appearance of the fracture structure of the polished surface and the same surface in etched condition permitted the drawing of extensive conclusions regarding the quality of the pieces produced. These methods were later supplemented by the examination of the mechanical properties with physical aids, such as the hardness, torsion and bending-breaking tests.

Fig. 2—A machined glass block; hard metal tools were used for the step-wise borings and the collet-like turnings.

Altogether, they gave an actual picture of the quality of the laboratory product produced at the time, from which it was possible very soon to characterize it as promising success, or discard it as unpromising. *The final judgment would, however, always have to be reserved for the practical operating experiment* — either the drawing experiment on the drawing bench or the cutting experiment on the lathe. These methods have been recently supplemented by the Röntgenographic (X-ray) method, which is especially useful in examining the interior structure.

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Regarding the industrial possibilities, so much has been published in the specialized literature of each individual branch that for the present I can dispense with saying more. Instead, I would like to say a few words regarding the processes which, in my opinion, play a deciding part in the production of the hard metal.

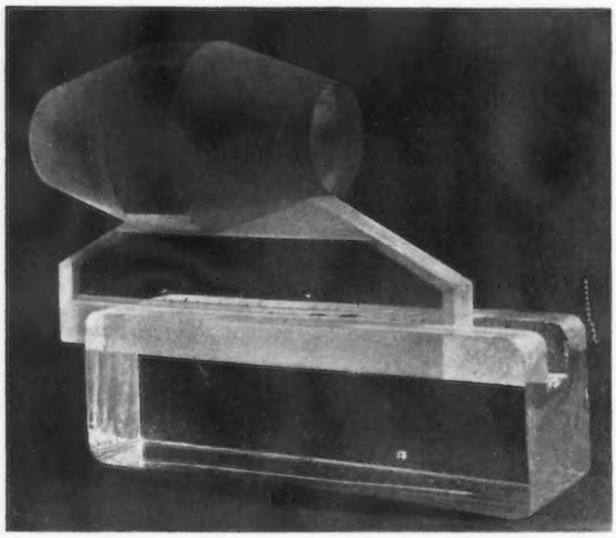


Fig. 3—Miscellaneous glass pieces which were planed, milled, and turned with sintered carbide tools.

Action of Cementing Material

It has already been mentioned that the real function of the added auxiliary metal is to lower the sintering temperature. This permits working at temperatures far below 2000 deg. C., and, therefore, the production of dense products without smelting. The denseness is a necessary prerequisite for a good hard metal. The advan-

tage of this process is that it is primarily an industrial operation, for it is not very difficult to produce and maintain a temperature of about 1500 deg. C., whereas a controlled temperature of 2500 to 3000 deg. C., required for smelting down during continuous operation, can only be produced with difficulty. Regarding the manner in which the reduction of the sintering temperature takes place, only surmises are possible, even though valuable experiments have been made by American investigators. That we are dealing simply with a thermo-dynamic influence, similar to that of melting temperature depression by solution admixtures, as one might surmise, was from the beginning improbable, because the observed effect was far too great. Also the requisite amounts of auxiliary metal indicated a coarser action. Next, the hypothesis was gradually developed that the carbide particles were being cemented by the added auxiliary metal, and this interpretation is probably the most prevalent today.

Thus, especially in American literature, we designate the auxiliary metal simply as cementing material. This point of view is strongly supported by the circumstance that in general it is necessary during sintering to reach the smelting temperature of the auxiliary metal. The molten auxiliary metal then surrounds the individual carbide particles, and, upon solidification, the mass sticks together more tightly as if all the carbide particles were directly welded together. The cutting action is then apparently exerted by the carbide particles which are embedded in the somewhat softer auxiliary metal, which acts, to a certain extent, as an elastic intermediate cushion, and renders harmless the unavoidable hard impulses. The brittle carbide would break if this were not the case.

This gives rise, however, to one, but only one, of several possible explanations. Probably during the examination of the details it will appear that we are dealing with more complex processes which proceed with great delicacy. For instance, there is little doubt but what the opposing solubility ratios of the auxiliary metal and the carbide play a rôle, for during prevailing solubility we can imagine that the cementing action is much more intimate than without such action. Also, in individual zones, we may be dealing with a reprecipitation of materials which had already been dissolved, a procedure which, as is known from other cases, strongly influences the material properties. We can, however, obtain further information only by practical researches, using all scientific and industrial means. I hope that the united endeavors of all interested groups may soon succeed in solving these riddles.

In a succeeding issue of THE IRON AGE, the author will review and develop the various theories of hard metal carbides.

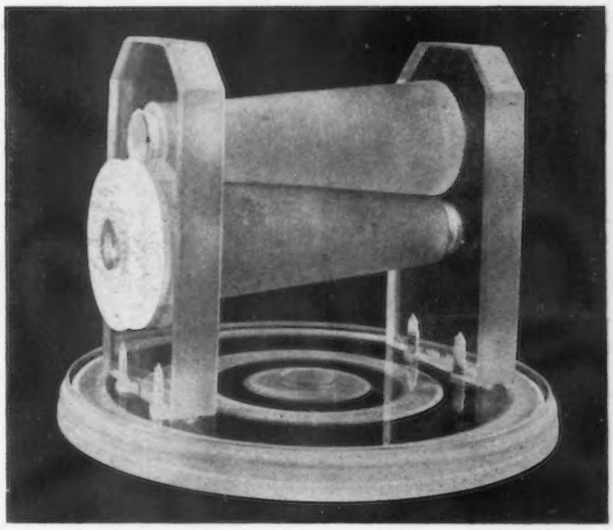
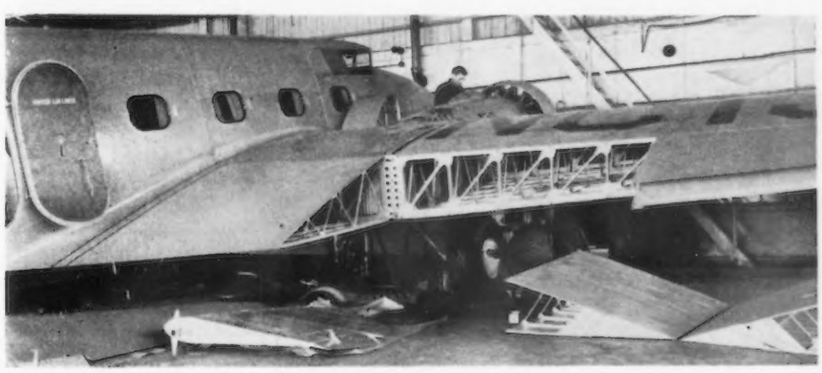


Fig. 4—Glass calender model (rolls for glazing or watering cloth, paper, etc.). The turning, milling, boring, and thread cutting were carried out with Widia.

Metal Ribs of the Mechanical Eagle

MODERN engineering and all-metal construction have given strength to the modern airplane far beyond that of a few years ago. This view of partially revealed wing construction of one of the Boeing transports of United Air Lines fleet shows the sturdy dural ribs, light as aluminum but strong as steel. The wing of this plane is capable of supporting a load of 36¼ tons—more than five times the total weight of a fully loaded transport. The fleet of 60 Boeing transports is the largest production job of all-metal passenger-cargo transports in the history of the industry. With a high speed of more than three miles a minute, they carry 10 passengers, two pilots, stewardess, mail and express.



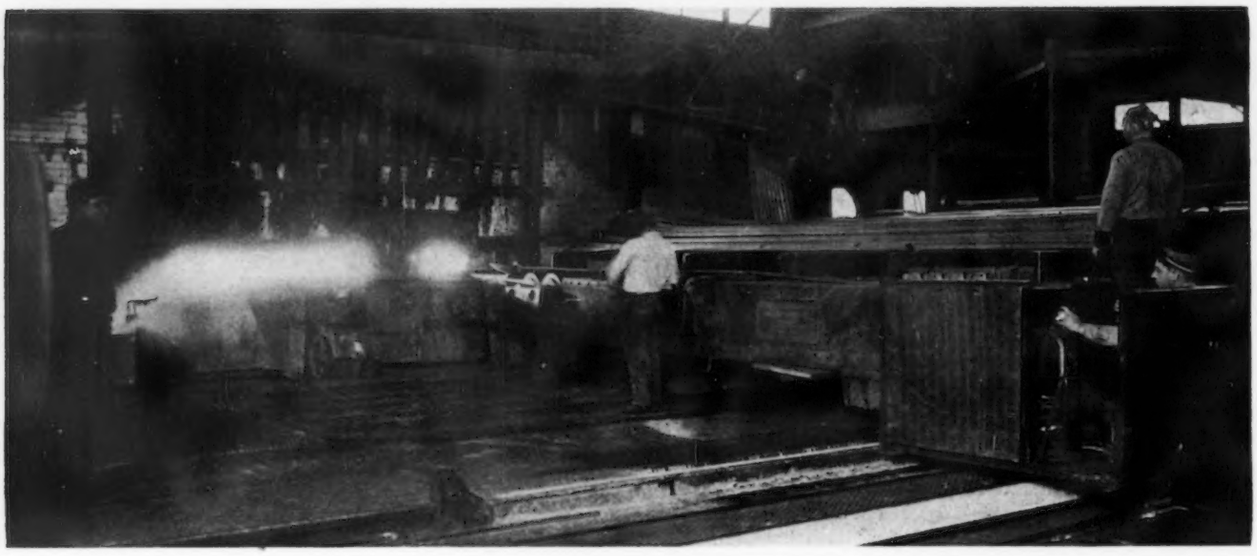
Tusko, mightiest elephant in captivity, tips the scale at seven tons, yet the wing of the United Air Lines plane is designed to withstand a load equivalent to more than five Tuskos.

Another evidence of the sturdy construction is that the steel chord of one of its inboard wing spars has a tensile strength of 140,000 pounds per square inch.

The landing gear is retracted in flight to add 20 miles an hour to the plane's speed. The gear, when down, is designed to withstand an emergency impact of 32½ tons.

The trend of passenger transport plane construction today is toward the low-wing, all-metal monoplane type.

The skelp heating furnace, one of which is here shown together with the charger, are gas fired with two sets of burners alternately used with air to support combustiorf received from regenerators

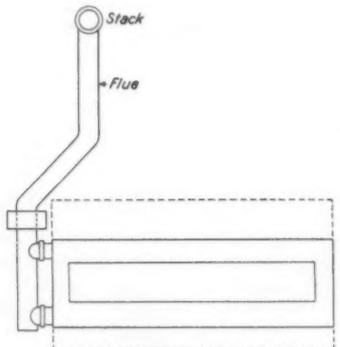


Gas Furnaces in a Pipe Plant

GAS-FIRED furnaces for heating skelp, for normalizing finished pipe, for heating the zinc pot of the galvanizing department and for steam raising are among the features of interest in the plant of the Pittsburgh Tube Co. at Monaca, Pa.

There are two pipe-making units. The furnace of one is of the regenerative type, 28 ft. square. It has a horizontal slot in both sides and the skelp is charged and discharged through these slots. On one side is a motor-driven charger operating back and forth on a track. Heat is supplied by means of 32 gas burners, 16 on each side. As air for combustion is drawn through hot checkers, the burners on each side fire at alternate intervals. Gas is carried along each side of the furnace by a 5-in. manifold and is fed to the burners by 1¼-in. pipes. Temperature control is aided by the use of recording pyrometers. The furnace of the second unit is smaller, 15 x 25 ft., and fired by 24 burners.

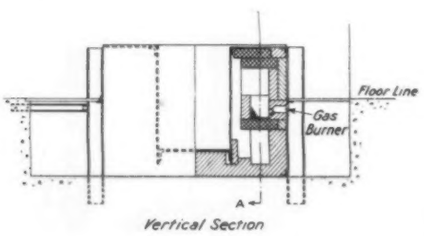
The normalizing furnace, which receives the finished welded pipe, is continuous in operation, of the walking beam type. It is 15 x 25 ft. in plan and equipped with 20 gas burners. Twelve of these are located on one side close to the roof so that they overfire the work, while the remainder are located low down in the opposite side and underfire the work. The burners are of the inspirator type, high-pressure gas being used to inspirate air for combustion. The furnace temperature is regulated by two automatic potentiometer-type recording controllers connected to three-position, motor-operated valves, cut into the gas manifold supplying the burners on each side.

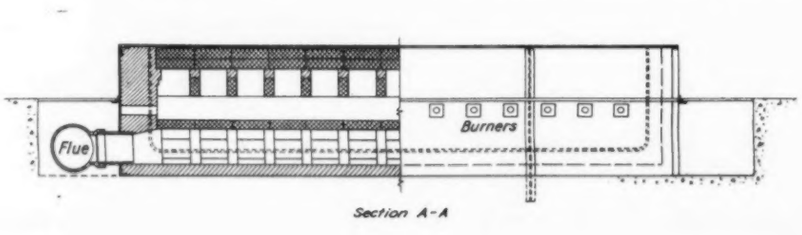


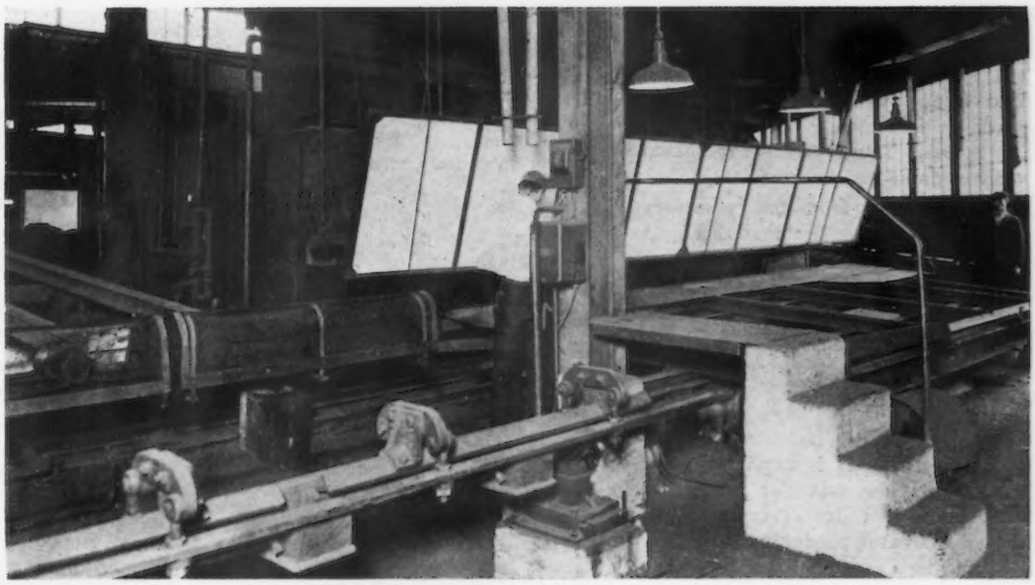
Sketch of the galvanizing installation shows the location and distribution of burners and flues.

The pipes to be normalized are carried through the furnace at the proper speed by seven mechanically operated walking beams which operate through slots in the hearth. The normalized pipes, on the discharge side, drop upon skids and are carried through straightening rolls back into the main production line.

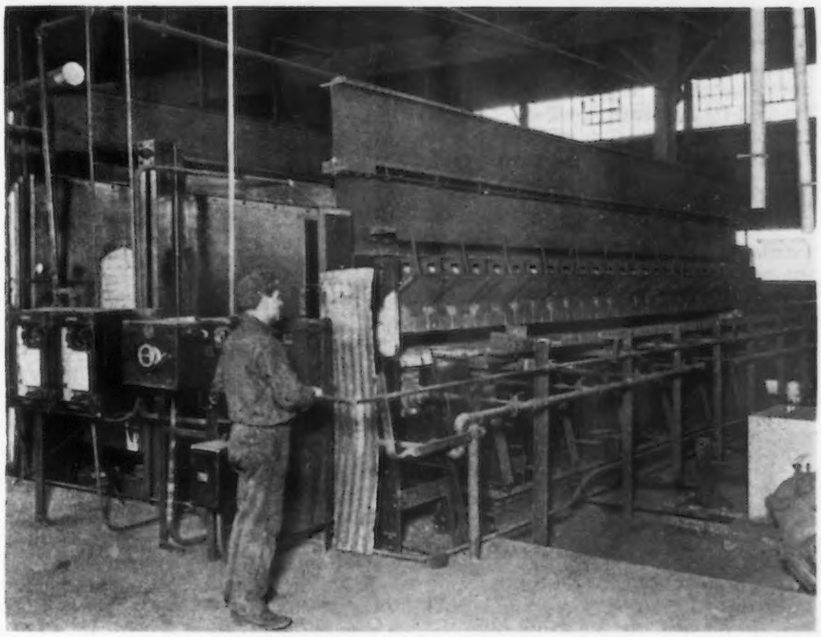
The galvanizing division contains four pickle vats, one galvanizing tank and a water vat for cooling. A bundle of work is placed by crane on a rack and an operator handles the pipes in







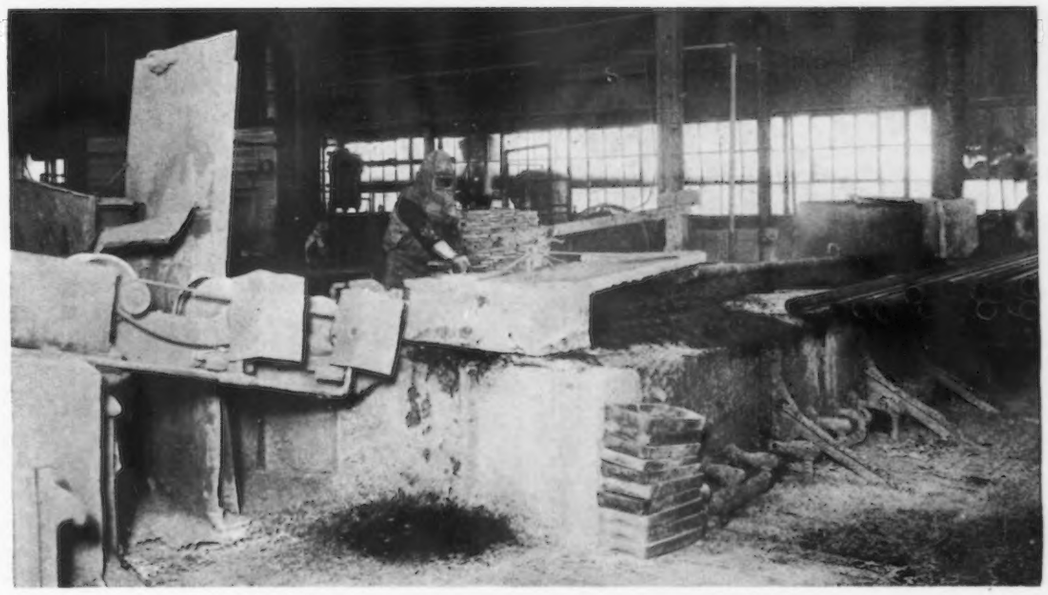
In this view of the discharge end of the normalizing furnace may be seen the tops of the burners that "overfire" the work and on the end of the furnace a motor operated valve in the gas line connected to an automatic temperature controller.



and out of the molten zinc, one at a time, with hand tongs. Magnetic rolls draw the galvanized product out of the bath over a line of rollers and excess zinc is blown off as the pipe passes through a blow ring made of special castings perforated on the inside to direct pressure air upon the pipe. Steam is blown through the inside for the inside cleaning and the pipe then rolls down inclined skids into the water tank for cooling on its way to the straightening rolls.

The galvanizing tank, which sets in a brick furnace, is 24 ft. long, 4 ft. deep and 42 in. wide. It is fired by 38 gas burners (19 on each side) of the high-pressure inspirator type. They fire through tunnels directly upon beds of refractory material so as to produce incandescence. These beds are inclosed in small chambers open at the top and spaced 4½ in. from the pot wall. The heat rises

(Above): On the charging end of the normalizing furnace, which is of the walking-beam type, may be seen the gas burners and temperature controllers and recorders.



(At Right): The galvanizing pot is heated from burners used in connection with refractory material to secure incandescent sources of heat that is transmitted to the pot by both radiation and convection.

and enters the open space next to the pot wall and is drawn downward into a flue which connects with a stack, as indicated in an accompanying sketch. The pot walls are heated without flame impingement.

The radiation from the refractory beds is found to promote complete combustion in small space and short time. While the furnace walls facing the kettle or pot radiate considerable heat to the kettle walls, most of the heat input to the tank is by convection. The distance between furnace and kettle walls was designed to provide high velocity for the products of combustion. It is urged that the method provides material savings in fuel, labor and dross accumulation, that it increases production and tank life and improves the quality of the product.

Steam used in this plant is made in a gas-fired tubular boiler, which is automatic and continuous in operation, so that an engineer or attendant is found unnecessary.

Sandblast Machine Has Wide Application

FOR cleaning castings, forgings, structural and heat-treated steel parts, steel tanks—inside or outside—and steel structures, the W. W. Sly Mfg. Co., 4712 Train Avenue, Cleveland, has developed a new general utility sandblasting machine, designated as type PB pressure blast tank.

This tank is simple in design and operation, and is of sturdy construction with a low center of gravity. It is furnished either with legs or mounted on wheels. A removable screen over the top prevents entrance of coarse products. The effective capacity of the tank—the amount of abrasive which will flow into the tank and out of it—is about 3 cu. ft., which is said to be large for the size of the tank because of the proportions of diameter and height of tank, and the cone-shaped bottom. Sand, metallic shot or metallic grit abrasive may be used.

Operation by a single control valve with only two positions, namely, on or off, is a feature. There are no moving parts in the path of the abrasive. The filling valve opens and closes automatically with turning the air on or off. When empty the tank weighs only 400 lb., which makes for easy portability. The low height facilitates placing it on a truck or trailer for moving from one job to another.

Drill Speeder for Boring And Other Machines

USED on horizontal boring and milling machines, radial drills and similar tools, the special drill-speeder unit illustrated, a new product of the Ex-Cell-O Aircraft & Tool Corpn., Detroit, affords the higher range of speeds necessary for drilling the small sizes of holes. The driver of the head is equipped with a No. 5 Morse taper and the drill spindle in the nose is fitted with a No. 3 Morse taper to accommodate drills up to 1 1/16 in. in diameter. The ratio of the drill speeder is 4 to 1 over the spindle speed of the machine on which it is used. It is stated that the maximum speed at which the machine spindle should be operated is 700 r.p.m., which gives a maximum drill speed of 2800 r.p.m.

The unit is provided with a boss on the outside diameter for inserting a bar to engage with a suitable bar mounted on the machine proper, as shown in the illustration. The boss for supporting the bar on the machine is furnished with the head. A knockout bar for drifting the drills from the high-speed spindle projects through the driving tang so that the drill can be removed by means of a drift pin inserted in the drift slot of the machine spindle.

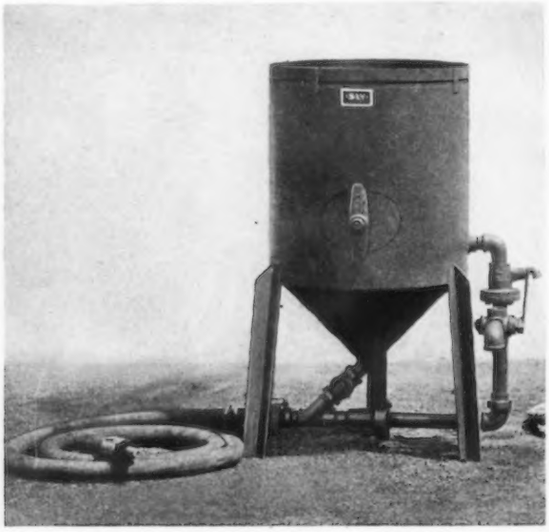
Develops Chuck for Light-Duty Lathes

STRENGTH, lightness and minimum of overhang consistent with good engineering practice are features of a new chuck offered by the Westcott Chuck Co., Oneida, N. Y., for use on light-duty lathes of all kinds.

The body is made of high-strength, close-grained nickel iron and is in one piece. The jaws are of case-hardening steel. They are hand fitted to the chuck and have raised and accurately ground steps. Mounted on a true spindle with a true adapter, the jaw steps are said to show a longitudinal run-out of less than 0.001 in. The long end of each jaw is serrated so that

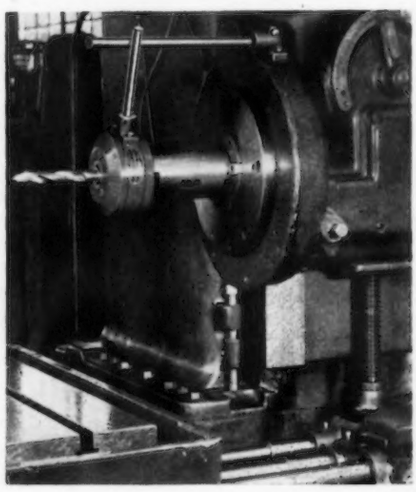
when the jaws are reversed they will grip bars, etc.

Jaw screws are threaded their full length except where necked for the bearings. They have mortised heads to take a square-end T-handle wrench. The steel used is said to be such as to assure no breaking of the heads even under extra hard service. Nickel steel is used in the thrust bearings. These are heat treated and fitted tightly into the chuck body. The chucks are now available in 3, 4, 5 and 6-in. sizes, all with four reversible jaws.



(At left): A portable as well as a stationary model of this pressure sandblast tank can be furnished.

(At right): Drill speeder mounted on horizontal boring and milling machine to provide higher speeds necessary for drilling small holes.



New Lees-Bradner Gear Tester

THE Lees-Bradner Co., Cleveland, has brought out the new gear tester illustrated, which will check tooth contour, arc of action, length of line of action, tooth to tooth spacing, cumulative error and eccentricity of both spur and helical gears. Either side of the involute curve may be checked without changing arbors, levers or turning the gears over—contact point is simply shifted to the other side of the tooth.

One attachment is supplied for testing tooth spacing and eccentricity, another for testing tooth contour. Direct-reading indicators record plus or minus variations in tenths of thousandths.

A characteristic of the Lees-Bradner gear tester is that it shows what is wrong, where it is wrong, and how much in tenths of a thousandth the tooth is off either in spacing, eccentricity or contour.

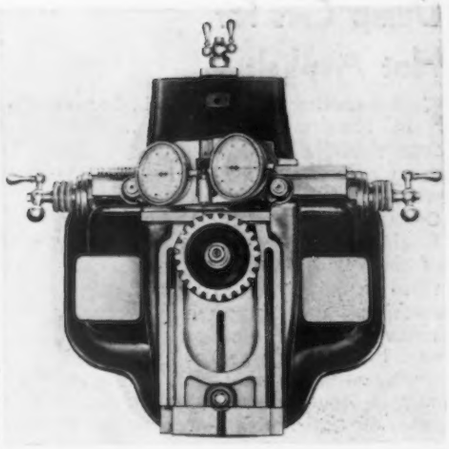
Method of Testing Tooth Curves

The tester is designed to employ the base circle of any given gear and then reproduce the tooth curve of that gear by rolling a tangent line upon the base circle and marking the path of any point in the tangent line. This is done by constructing a machine upon which is mounted the base circle with provision for holding the straight edge in contact with the base circle with sufficient pressure to insure that it will roll upon the base circle without slippage.

A contact lever is mounted upon the straight edge, with its contact surface intersecting the face of the straight edge which forms the tangent to the base circle. Two rollers, mounted upon ball bearings, are carried by the straight edge and serve to hold the straight edge under spring pressure against the base circle. This spring pressure is adjusted by a tension screw.

When the base circle is rotated, the straight edge is caused to roll upon it and the contact lever traces the involute curve.

Any movement of the contact lever away from the true involute curve is registered on indicators which read in tenths of thousandths, plus or minus. Tooth contour indicators are mounted on a tilting member and locked in any desired position within limits of machine. Movement of contact lever is always normal to the tooth. A graduation on the straight-edge carrier indicates upon the graduated scale of the cross-rail the distance that the straight edge has been rolled upon the base circle and thereby shows when the contact lever reaches certain successive positions on the involute curve and also measures the length of line of action.



Testing of tooth to tooth spacing and eccentricity is pictured at the left. The top view of the machine (above) shows the arrangement for testing tooth curvature.

A gear is placed in position for testing tooth curve with contact lever engaging one tooth of the gear which is clamped to the base circle by means of a nut on the upper end of mandrel. The indicator is set at zero when the contactor touches the gear tooth at the base of the circle or at the working depth of the tooth in case this depth does not go all the way down to the base circle. The graduation on the straight-edge carrier points to zero on the scale of the cross-rail when the contact lever is at the base circle, but when the teeth are not deep enough to reach the base circle the readings start a little way from zero. The base circle is now rotated, causing the contact lever to travel up toward the point of the tooth.

The graduation on the scale of cross-rail will mark off a number of successive positions of the contact lever as it travels up from the base circle toward the tooth point, so that a record may be kept of the indicator readings. This, it is stated, establishes an absolute system of measurement by means of which all gear teeth may be compared with the true involute. It is thus possible to establish a standard of accuracy and to determine whether or not any gear out of regular production is accurate within the specified limit.

Testing Tooth Spacing and Eccentricity

Provision has been made for a simultaneous check of tooth to tooth spacing and eccentricity. The space testing device consists of a base mounted on the machine and carrying a lever actuated slide movable radially of gear being tested. Movement of the lever in one direction retracts the slide and when released slide is restored to its initial position by a compression spring. Located on this slide is an adjustable carrier, adjustable toward and away from gears of various pitches. Trunnioned therein is an angularly adjustable carrier locked in position by the two knurled nuts and having at its axis a bore to receive the conical tooth engaging member which may be changed for gears of different pitches and pressure angles. Cones are interchangeable and one only, according to pitch and pressure angle, is furnished with machine.

This trunnioned or swiveling member also carries the contactor for tooth spacing and indicator for space errors and is adjustable to gears of 50 deg. right-hand or left-hand. Here also all measurements are normal to the tooth. Tooth contactor for space errors is adjustable on a small cross-slide straddling cone in order that it may be set for various pitches. Readings on the indicator are direct in ten-thousandths of an inch.

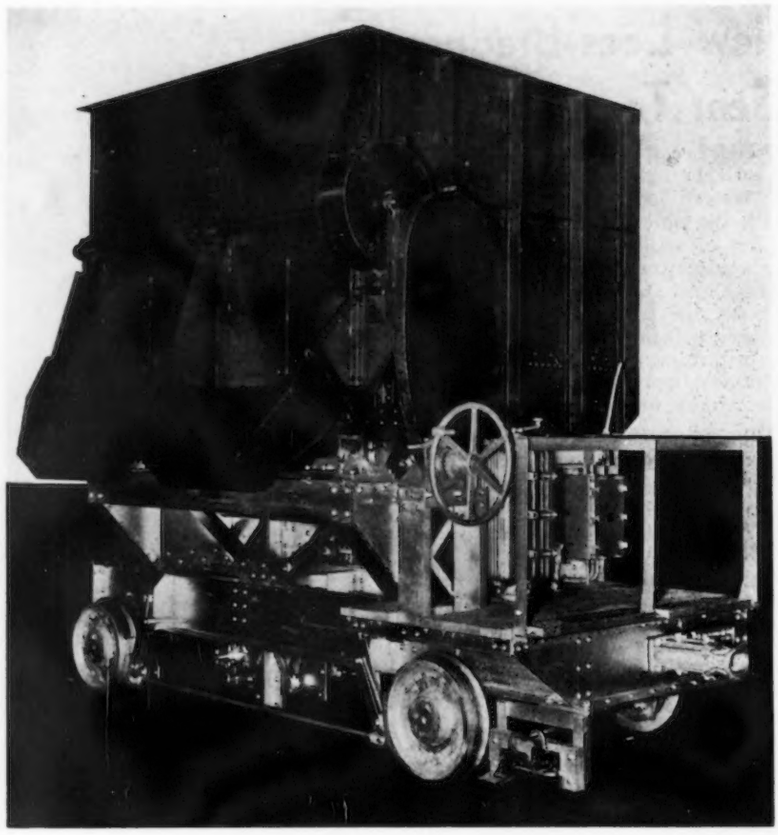
In operation the entire assembly is placed in the machine and adjusted with the cone fully engaging space in gear. The eccentricity indicator on side of the fixture, reading direct in ten-thousandths of an inch, is set to zero. The space tooth contactor is then adjusted to one side of the gear tooth and its indicator set to zero. The gear being tested is preferably free on the mandrel. The handle on the fixture is then pulled toward operator, withdrawing both cone and contactor, the gear rotated through space of one pitch and the handle gently released, allowing tooth contactors to engage gear under spring pressure, thereby eliminating the possibility of varying pressure on the contactors.

Dump Cars for Hot Asphalt

FOR handling hot asphalt in barges in Mississippi reclamation work four electrically operated 20-ton side dump cars of a special design recently were built by the Atlas Car & Mfg. Co., Cleveland, for the United States Engineers, New Orleans. The body of the car is watertight and is provided with a top having watertight combings and hinged hatch covers. There are two discharge gates operated by a hand wheel with a clutch arrangement so that only one gate may be operated at a time. These gates are fitted with hinged spouts to deflect the asphalt into the conveyors. The bottom of the hopper has a steam jacket with pipe inlets and outlets at each end according to established standards for 150 lb. per sq in. steam pressure.

A motor drives the car through a triple-reduction spur gear totally inclosed in a speed reducer. The full load speed is in excess of 90 ft. per min. Shunted armature control is provided with a special resistor to give creeping speeds down to 13 ft. per min.

The body is dumped by a telescoping-type hydraulic hoist with the pump directly coupled to the motor. The electrical equipment is weather tight and marine specifications are practically followed throughout. Wiring is in rubber-covered, leaded and armored cable. A foot brake is provided with brake shoes operating on all wheels. Journals are mounted on Hyatt roller bearings.

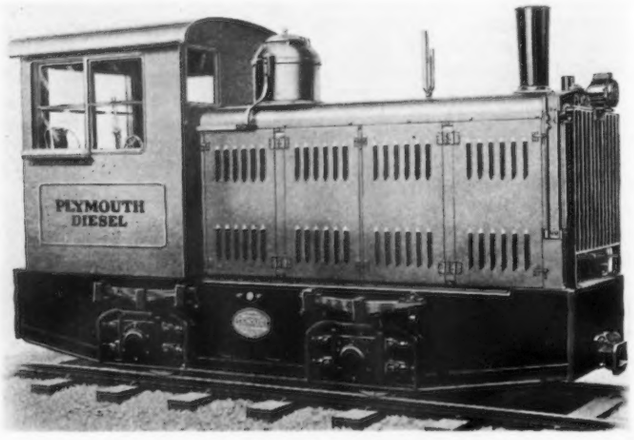


New Diesel Locomotives Have Welded Frames

TWO new Plymouth Diesel locomotives, in 8 and 12-ton sizes, have one-piece steel frames and several other recently developed features. The improved power plants used in the two models, which were brought out by Plymouth Locomotive Works, Plymouth, Ohio, comprise a 4-cylinder engine developing 66 hp. at 850 r.p.m., and a 6-cylinder engine capable of producing 102 hp. at 820 r.p.m. The large engine capacity assures surplus power at all times during normal operating routine.

The welded joints are amply braced to prevent excess straining, and the suspension is by means of semi-eliptic cross and equalized springs. The springs are located outside the frame for easy accessibility and inspection, and the arrangement is said to give excellent riding qualities even on rough and uneven tracks.

A heavy-duty sliding gear transmission is standard equipment. Both gears and shafting are made from specially heat-treated alloy steel, and are supported on ball and roller bearings. The clutch is of the dry plate type and can be easily removed for servicing without interfering with or moving the engine or transmission. Provision is made for four forward and four reverse speeds.

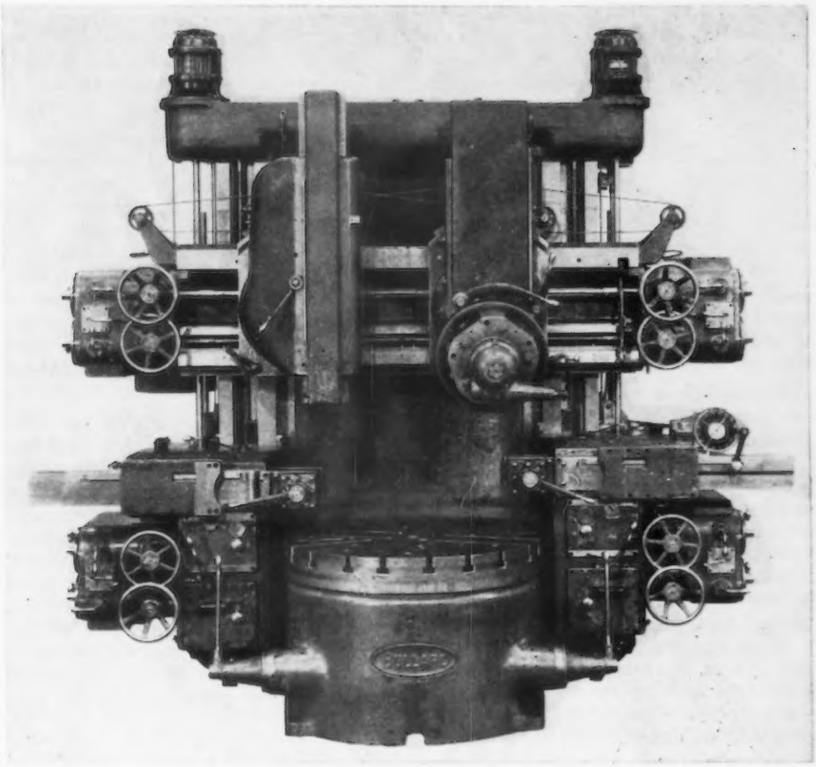


Lessons In Arc Welding

A SERIES of 28 lessons in arc welding, consisting of some 60 mimeographed pages illustrated by sketches, is being published by the Lincoln Electric Co., Cleveland. The lessons, based on the arc welding course given by Arthur Madson at the Lincoln plant, are the result of experience in teaching several thousand men to become practical arc welding operators. They include study of the Lincoln arc welder; running of a horizontal bead; study of several types of weaving or movement of electrodes; effect of arc length, current and speed on the bead; effect of polarity; study of padding; building up of a shaft; making of vertical beads and many other practical topics. The price is 50 cents.

Caterpillar Tractor Co., Peoria, Ill., reports sales for 1933 totaling $14,408,002, which was an increase of 8 per cent over 1932. Profit for the year 1933 amounted to $302,716 as compared with a loss of $1,616,872 for 1932.

New Vertical Turret Lathe Features Hydraulic Table Speed Shift



Sixteen speeds are obtainable by the dial selector and hydraulic shift. Each head has independent feed works and power traverse both vertical and horizontal, is provided on all heads.

MAXIMUM flexibility, high operating efficiency and massive construction were basic objectives in developing the Hydro-Shift vertical turret lathe recently announced by the Bullard Co., Bridgeport, Conn. This lathe is built in 56, 66, 76 and 86-in. sizes.

The machine derives its name from the hydraulic table speed shifting mechanism, which includes a large, direct-reading dial indicator located at the right-hand side. To change speeds, the operator merely sets the dial to the speed desired, moves a clutch lever to bring the table to a full stop and then throws the same lever back into the engaged position; in the interval, the gears are shifted automatically by means of a hydraulic arrangement actuated by filtered oil under pressure from the main oil pump. This simplified speed changing method eliminates the necessity of figuring the combination of levers that will give the desired speed.

Anti-friction bearings are employed throughout the machine except for the table bearings. All parts are designed for heavy-duty load of four heads and 60 hp., with a factor of safety of 4 at lowest speed. Bed castings are heavily ribbed and are of sufficient thickness to eliminate vibration and provide firm support for the cross-rail, main heads and side heads. Bearing surfaces are wide and gibs are heavy. Cross-rail, main-head saddles, swivels, and side heads are also of heavy design, these castings being of one piece and well ribbed to assure maximum strength, long accuracy, and to eliminate weave under heavy cutting. The heavy construction is reflected in the weights of these machines, which, with the two main and two side heads, are 52,000, 61,000, 68,000 and 77,000 lb. respectively.

The cross-rail is provided with raising screws driven by an individual motor for raising and lowering. It may be equipped with two heads, one of ram type for boring and one of turret type, or two of ram type. In both, the saddles are of cast iron and the slides are of steel castings. Turrets are of forged steel. The turret is indexed by means of a crank handle and worm gear arrangement that precludes the possibility of kick-back on the crank when indexing the turret from one station to another, if the tooling is such as to give a condition of unbalanced weight. Binding of the turret is from the outside diameter, rather than from the turret axis.

Each of the rail head slides may be swiveled up to 30 deg. right or left. Each head on the cross-rail has its own feed works, which provide for rapid traverse vertically and horizontally, as well as separate feeds for each head.

Use of two side heads increases the efficiency of the machine. These side heads are mounted directly on the bed ways, thereby eliminating the necessity for an intermediate saddle. Their slides are forged bar steel rams provided with four-face indexing turrets. A sturdy brace plate bridges the width of the slide groove in the casting, thereby eliminating any possible weave.

Individual feed works for each side head make for flexibility. Individual functioning of the feed works permits vertical or horizontal feed of the head and slide respectively as well as vertical power traverse of the side head with horizontal power traverse of the slide. Thus the head may be power traversed up or down while the slide is being fed in or out. The heads may be locked in any fixed position while the slide is being fed in or out or vice versa.

To simplify operation, direct-reading dial controls are located on the end of each feed works, permitting convenient change of the feed of any head at any time without stopping the table or the other feed works. Direct-reading micrometer dials with adjustable observation stops provide a quick and accurate means of holding limits and duplicating sizes after the first setting has been completed. On each head, feed levers control the starting and direction of feed. A trip lever on the front of the feed works provides for instantly stopping the feed of any head merely by pressure of a finger. Power traverse handles are designed to spring into neutral as soon as the hand pressure is released, thereby avoiding overrunning the limit, due to leaving the traverse in motion. Another safety device, called the automatic overload kick-out, prevents damage due to jamming from carelessness or overload.

The feed works operate the power traverse at a rate of 13¾ ft. per min. The selector dials at the end of each feed works provide 16 feeds, from 0.010 to 0.500, on all sizes of the machine. Hammer handwheels on the front of the feed works enable the

operator not only to move any of the heads or slides quickly over short distances, but also permit accurate and fine feeding when starting or finishing the cuts.

To permit complete control from either side of the machine, the clutch and brake levers are located at each side of the table within easy reach and yet without interfering with chucking of the work. These levers operate to start and stop the table speeds and head feeds. This feed control is, of course, in addition to the individual main feed controls located on each feed works.

Lubrication, a basic factor in low cost maintenance and long machine life, has been given special attention. The oil pump is located within the bed and connected directly to the headstock. It takes lubricant from the oil pump, passes it through a filter system and distributes it under pressure regulated to suit requirements. By this method, the ways of the rail, saddles, and slides are automatically oiled, as are the feed screws, racks, pinions and down-feed rods. Forced lubrication is delivered to the spindle and all other bearings of the headstock and side heads. The feed works contain their own reservoirs, rather than being connected with the main system. Filters are accessibly located and are simple to clean, the sludge being removed from the filter merely by rotating a handle, which causes the sludge to drop into a sump that is isolated from the circulation system.

The system of counterweighting is a feature. Each head is counterweighted individually through a system of steel cables and pulleys that run on anti-friction bearings. By traveling the weights twice the distance of the sliding members it has been possible to reduce the weights to one-half those usually required. The weights are either covered or concealed within the machine for safety and appearance.

Main drive motor of 40 hp. 900 r.p.m.; rapid traverse motor of 2 hp. 1200 r.p.m.; and the rail raising motor of 3 hp. 1800 r.p.m. are push button controlled. The push button control of the rail raising motor is interconnected with limit switches which serve to stop the rail at the extreme high position as well as preventing the bumping of the cross-rail on the side heads while in downward motion. This avoids straining the alinement or mechanism of the rail or the side heads.

Coolant systems have been designed for these machines. The smallest lathe has a separate metal reservoir, while the three larger machines require a reservoir in the concrete foundation floor. This requirement of a concrete water pan is based upon the fact that the heavier machines give best performance and remain level when firm settings are provided.

Accessories in keeping with the design of the machine have been developed. A single attachment which may be operated from either the right-hand main head or the right-hand side head meets the requirement for thread cutting, drum scoring and scroll cutting. In addition, a forming attachment may be affixed to the right-hand side head.

CAPACITY	56 In.	66 In.	76 In.	86 In.
Diameter, in.	56	66	76	88
Under rail, in.	47	56¼	62½	68¼
Under turret face, in.	58¼	67½	73¾	79½
Floor to top of table, in.	34	34	34½	35¼
TABLE				
Diameter, in.	50	61	71	83
Thickness, in.	6½	6½	7½	8¼
TURRET RAIL HEAD				
Vertical movement, in.	30	30	30	30
Will face, in.	56	66	76	88
Turret diameter, in.	20¼	20¼	20¼	20¼
Turret hole, in.	3½	3½	3½	3½
LEFT HAND RAM HEAD				
Vertical movement, in.	48	48	48	48
Will face, in.	56	66	76	88
Bar diameter, in.	4½	4½	4½	4½
FEED CHANGES				
Number	16	16	16	16
Maximum	0.500	0.500	0.500	0.500
Minimum	0.010	0.010	0.010	0.010
TABLE SPEEDS				
Number	16	16	16	16
With 900 r.p.m. motor, min.	3.1	2.6	2.2	1.9
max.	74.1	60.8	52.4	44.2
With 1200 r.p.m. motor, min.	4.2	3.4	2.9	2.5
max.	99.5	80.7	69.5	58.8
With 1200 r.p.m. motor and 17 tooth table pinion, min.	5.1	4.1	3.5	3.0
max.	120.0	98.0	85.0	71.5
SIDE HEADS				
Vertical travel, in.	35½	44¾	51	56¾
Horizontal travel, in.	30⅜	30⅜	30⅜	30⅜
Top of table to under side of slide in high position, in.	35½	44¾	51	56¾
Number of turret faces	4	4	4	4
Turret size, in.	6½x6½	6½x6½	6½x6½	6½x6½
Tool size, in.	1¼x2	1¼x2	1¼x2	1¼x2
Maximum diameter side head will turn, in.	56	66	76	88
Minimum diameter side head will turn, in.	0	5¾	15¼	29
FLOOR SPACE				
Projected, in.	170x180	180x192	190x208	200x216
Maximum height, in.	173	183	189	196

General Motors Trains Guns on Steel Code

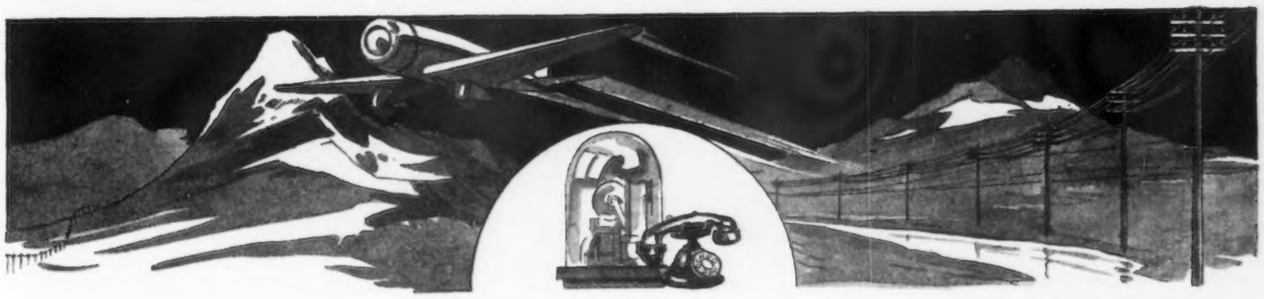
GENERAL MOTORS CORPN. is reported to have started a retaliatory campaign against large steel companies as a protest against certain provisions of the steel code, particularly the refusal to grant preferential prices for large quantities of one item. It has reduced by 10 per cent or more the tonnages allotted to leading steel companies and has spread out orders among a large number of small mills. The threat to purchase the Corrigan, McKinney Steel Co., Cleveland, is regarded as part of this campaign, which also is protest against further price advances for second quarter. It is understood that the allotment of more business to small mills was made by high officials of General Motors, who ordinarily give purchasing executives a relatively free hand.

Dissatisfaction with the operation of the code has already resulted in a successful campaign by automobile companies to reduce stainless steel prices, it is said. Motor car builders threatened to go to chromium plating, it is reported, if stainless steel quotations were not revised downward.

Prices on Plate Seconds

NEW base prices on plate seconds, f.o.b. Gary, Ind., have been filed with the American Iron and Steel Institute. Steel plate seconds sheared into rectangular shapes in random sizes and gages and unassorted are quoted at 1.15c. a lb., Gary. No single piece is to contain over 35 sq. ft. and the quality is not guaranteed. Plate seconds of this description assorted to gage are quoted at 1.25c.

Other prices on unassorted plate seconds have been filed as follows: 1.20c., Sparrows Point, Md.; 1.50c., Gulf Ports; 1.65c., Pacific Coast ports. Prices on assorted plate seconds for the same points are as follows: 1.30c., Sparrows Point, Md.; 1.60c., Gulf Ports; 1.75c., Pacific Coast ports.



THE NEWS OF THIS WEEK

Bethlehem Shows Profit for Quarter, Grace Sees Need for Private Financing

BETHLEHEM STEEL CORPN. reported a net profit of $629,671 in the fourth quarter of 1933 as compared with a loss of $283,097 in the previous quarter. The improvement in earnings was made in the face of a decline in operations, but was not due to better prices. Increased billing prices were offset by the rise in costs, said Eugene G. Grace, president, in commenting on the report, and the profit shown was wholly attributable to the clean up of contracts and year-end adjustments.

While expressing satisfaction with the betterment of business, Mr. Grace voiced concern because virtually all of the improvement was traceable to Government spending. "I do not believe we will be on a permanent foundation for recovery until business and industry are in a position to supply their own working capital through earnings and new financing."

He scored the securities act as a barrier to private investment. "My concern for the future," he declared, "is when is business going to finance itself and create its own buying power? When will business become independent of Government funds? There are opportunities here for private capital, and private capital is available, but certainly not until the securities act is modified.

"I do not believe the American public is willing to turn over business to the Government, and I do not think the public wants business to depend on Government money, nor do I believe that the Government itself wants such a condition."

The rail program sponsored by the Government to provide winter employment has failed to materialize, according to Mr. Grace. Steel producers cut the rail price to assist the Government in its announced plan to provide additional work and were assured by the Federal coordinator of transportation that 850,000 tons of rail contracts would be placed. The mills fully expected that they would have a good volume of business in rails on their books by this time. "We have been receiving a few orders, but not from railroads borrowing from the Government," Mr. Grace said.

Referring to the effect of the steel code on small companies, he said, "I frankly believe that the small manufacturer and the small consumer are better protected under the steel code than they were before."

Export business showed a steady increase in 1933 and exceeded that of the previous year by 25 per cent.

The company's unfilled orders on Dec. 31 totaled $67,684,749 as compared with $72,155,458 at the end of the previous quarter, and $30,568,937 on Dec. 31, 1932. A little more than $20,000,000 of the total at the end of last quarter was represented by the corporation's naval and shipyard business.

"It looks as though this Congress will authorize additional naval construction, and if it does, we hope that Bethlehem will get its share," he said.

The net income of $629,671 in the fourth quarter was equivalent to 67c. a share on the 933,857 shares of 7 per cent preferred stock. The profit was the first reported since the quarter ended June 30, 1931. For the entire year 1933 the corporation showed a net loss of $8,735,723, as compared with a deficit of $19,404,431 in 1932. Total income in the fourth quarter was $5,790,023, while interest charges were $1,692,586 and provision for depletion and depreciation was $3,467,766.

Gross sales and earnings for 1933 aggregated $121,745,344 as compared with $98,467,226 for 1932. The total amount of new business booked during the year amounted to $158,861,156 compared with $87,388,870 for 1932.

Operations averaged 26.8 per cent of capacity during the fourth quarter as against 40.8 per cent during the third quarter. They were 28 per cent for the entire year, as compared with 16.9 per cent in 1932. Current operations are about 30 per cent of capacity.

Cash and liquid securities on Dec. 31, 1933, amounted to $46,888,841, compared with $46,975,589 on Dec. 31, 1932.

The net reduction in funded debt during 1933 was $4,955,781.

Cash expenditures for additions and improvements to properties in 1933 totaled $2,045,669. The estimated cost to complete construction authorized and in progress as of Dec. 31, 1933, was $447,000.

Earnings of Labor Rise In December

EMPLOYMENT, average hourly earnings and average weekly earnings in manufacturing industry increased by fractions of 1 per cent in December, while average hours worked per week remained stationary, according to the National Industrial Conference Board. In comparison with preceding months, employment conditions in December showed marked stability.

The average industrial wage earner in December, the Conference Board finds, worked 34 hr. per week, earned 54.8c. per hour, and received $18.58 in his weekly pay envelope. In the same month one year ago, weekly work time averaged 35.4 hr., at 46.7c. per hour, yielding weekly earnings of $16.37. The buying power of the wage-earner's income increased during the year 10 per cent, owing to the fact that weekly earnings rose 13.5 per cent, while the cost of living advanced only 2.9 per cent.

Although increased employment from November to December was reported in only 10 of the 25 industries covered by the Conference Board's monthly surveys, increased hourly earnings were reported in 21 industries, and increased weekly earnings

in 14 industries. The increased weekly earnings resulted in nine instances from a combination of slightly increased hours and increased hourly earnings, in four instances from increased hourly earnings large enough to overcome reductions in hours, and in one instance from increased hours making up for decreased hourly earnings.

The 14 industries in which average weekly earnings increased from November to December were as follows: agricultural implements, $21.96 to $22.11; chemical, $19.82 to $20.17; furniture, $15.38 to $15.44; iron and steel, $18.59 to $19.80; leather tanning and finishing, $19.42 to $19.70; lumber and millwork, $14.77 to $15.54; meat packing, $19.45 to $21.00; paint and varnish, $21.01 to $22.23; printing—book and job, $25.80 to $26.27; printing—news and magazine, $29.38 to $30.10; rubber, $20.48 to $21.45; foundries, $15.21 to $16.27; hardware and small parts, $16.64 to $17.10; other products of foundries and machine shops, $17.91 to $18.16.

Dalton and Purnell Discuss Steel Code

CONFIDENCE in the outlook for the steel industry was expressed by H. G. Dalton, chairman of the board of the Youngstown Sheet & Tube Co. and senior partner of Pickands, Mather & Co., at a dinner held Thursday evening, Jan. 25, at the Youngstown Club for Youngstown Sheet & Tube Co. sales representatives from all over the country, in Youngstown for a sales conference.

"There is today definite proof of industrial recovery," Mr. Dalton said. "Naturally progress must be slow, and we cannot expect too much. Nevertheless I believe there is no question but that the steel industry and general business will have a materially better year in 1934 than was the case in 1933."

The chief subject of discussion at the meeting was the steel code.

"In cooperation with the desires of the Administration and the purposes of NRA," said Frank Purnell, president of the company, "the steel industry has greatly increased wages, decreased hours, and added to the number of employees upon its pay roll. This was done in the face of declining operations, and only slight advances in prices.

"In order to maintain employment and wages on this basis it is absolutely necessary that the industry be assured of a net operating income sufficient to carry these wage increases. This must be accomplished through strict adherence to the terms of the steel code with respect to competitive practices, which were formulated in accordance with the desires and provisions of the Administration."

Foundry Equipment Order Index Improves

THE index for net orders of new foundry equipment during December was 43.2 for 19 reporting companies, as compared with 36.62 in November for 21 reporting companies, and 16.5 for December, 1932, for 13 companies. The indexes of shipments and unfilled orders for December were 38.2 and 35.2, against 38.31 and 29.63 respectively for November. The gross orders for the entire last quarter of 1933 were more than 100 per cent above the orders for the corresponding period in 1932.

Structural Bookings Down in 1933

BOOKINGS of structural steel during the past calendar year of 1933 were approximately 5 per cent less than those of 1932, while the shipments were 12 per cent under, according to a compilation by American Institute of Steel Construction. It would appear from this that the decline has temporarily stopped. This is further indicated by the fact that the December bookings were the best recorded for any month of last year, being 39 per cent larger than for November, and November were slightly better than October bookings. December shipments, however, showed but a 2 per cent increase over November, bringing the shipments for December up to a par with other months of the year.

Playground, Tack and Staple Code Hearings

PUBLIC hearings will be conducted, beginning at 10 a. m., Tuesday, Feb. 6, in the Fairfax Room, Willard Hotel, Washington, D. C., on three additional supplements to the approved basic code of fair competition for the Fabricated Metal Products Manufacturing and Metal Finishing and Metal Coating Industry.

The divisions of the industry presenting these three supplementary codes are: Playground, Beach and Pool Apparatus Industry; Cut Tack, Wire Tack and Small Staple Industry, and the Hog Ring and Ringer Industry.

B. of S. to Continue Simplified Practice

IT has been decided to continue the simplification and commercial standards work at the Bureau of Standards, in cooperation with the American Standards Association and other organizations and groups concerned with such work. The task has an added importance at this time because of the need for reference to standards of dimensions and quality in the NRA codes of fair competition.

In order to provide maximum benefits for the ultimate consumer, the bureau, in accepting simplified practice projects, will give priority to those in which the producer groups will signify, in advance, their willingness to identify simplified items in their catalogs and other trade literature.

Similarly, in accepting commercial standards projects, the bureau will give priority to those in which the producer groups will indicate, in advance, their willingness to employ labels on the product, constituting binding guarantees of compliance with the standards set up in order that the maximum service may be rendered to the consumer in over the counter trade.

Scullin Steel Co. To Resume

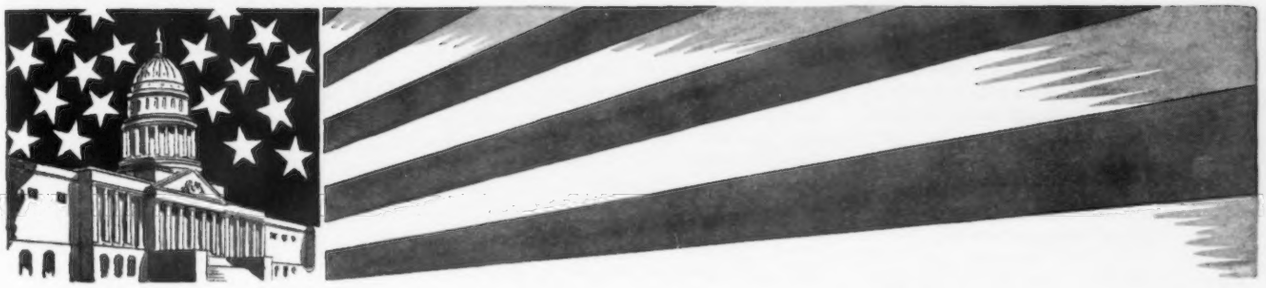
ST. LOUIS, Jan. 30.—The Scullin Steel Co. will resume operations Feb. 8, after having been closed down since Nov. 15, according to Harry Scullin, president. Orders from railroads now on hand or in prospect are sufficient to require operation of the plant at 40 to 50 per cent of capacity for several months. The company will begin with a force of 400 to 450 men.

Heating and Ventilating Exposition Opens Feb. 5

THE third international heating and ventilating exposition will be held at Grand Central Palace, New York, on Feb. 5 to 9, inclusive. A large number of manufacturers have already secured space, and the show is expected to include a complete line of standard heating, ventilating, and air-conditioning units. The various exhibits will include oil burning equipment for all purposes, all types of boilers, latest advances in cooling units, air filters, building insulation, instruments, and controls. There will also be a complete exhibit of structural steel, steel piping, and boiler tubing.

Convention Lecturers Will Discuss Enameling

A NUMBER of papers describing various enameling methods are scheduled to be presented at the forthcoming convention of the American Ceramic Society, which will be held on Feb. 11, at Cincinnati, Ohio. Studies concerning enamel adherence, application, glazing technique, etc., are included in the program.



THIS WEEK IN WASHINGTON

NRA Heeds Senatorial Criticism

Establishes Plan to Protect Small Business. Wagner to Support Congressional Move to Broaden Labor Board's Powers

By L. W. MOFFETT
Resident Washington Editor
THE IRON AGE

WASHINGTON, Jan. 30.—Despite fulminations of NRA officials against critics of the Recovery Administration recent developments clearly disclose that it has been responsive to attacks.

There have been three recent notable changes made that are attributed to criticism made in the Senate, particularly by Senator Borah and Senator Nye. Regardless of the merits of the complaints of the Senators that the NRA is encouraging monopolistic tendencies and oppressing the small enterprises, the fact remains that General Hugh S. Johnson, National Recovery Administrator, has announced a plan for the protection of small business or units of industries and consumers "allegedly oppressed by the operation of larger groups under a code." Under the plan a board of prominent citizens would be established to which appeal could be made by "the little men." General Johnson previously had denied emphatically that small business enterprises have been oppressed by the NRA. He has not yet admitted that they are being oppressed. Yet his willingness to set up a board to hear complaints reflects a conciliatory tone not in keeping with his former vigorous verbal forays against Senatorial and other "champions" of the small enterprise.

It is still the position of General Johnson that most complaints that small enterprises are being oppressed by large ones come from establishments which exploit workers. Heretofore he gave scant consideration to plans for their consideration by the NRA. The proposed board, however, would have this matter as its sole task.

This is not all that has been done for the "small enterprise." More far reaching was the executive order recently issued by the President passing to the Federal Trade Commission or, if necessary, the Department of Justice, complaints of those who are dissatisfied with NRA rulings. The order was said to be designed especially for small business. General Johnson, when asked if he was satisfied with the executive order, is reported to have replied: "I ought to be; I wrote it." The statement came as a surprise. The bitterest kind of an attack was made on the Commission by General Johnson in his recent speech in New York before the National Retail Dry Goods Association. He tore into the Commission right and left and denounced it as being anti-business, entirely unacquainted with the problems of industry, and even held it partially responsible for the depression.

Senatorial Criticism Is Heeded

Therefore to write an order setting up this same body as a sort of a court of appeals with the right to overrule his own organization assuredly has the decided mark of heeding criticism, especially Senatorial criticism, and also criticism within the Administration itself.

The writing of the order by General Johnson must have meant the plucking of feathers that made the Blue Eagle scream. The order also apparently had as its partial background the squabble between the Commission and the NRA over the basing point system in the iron and steel industry. The Commission, apparently, is bitter because it has lost temporarily or permanently its fatherhood of this precious child which has furnished the Commission with many headlines and a questionable authority which it thinks had passed to the NRA.

Another change General Johnson made in behalf of the small enterprise was to select Divisional Administrator A. D. Whiteside as a special assistant on credit and finance to look after the needs of "smaller business where the difficulty of obtaining credit may be one of the severest handicaps in competing with larger enterprises." This change was made following the Presidential order and it in turn preceded the plan for the board to hear complaints of small enterprises.

Whatever may result from these new set-ups, and passing by their merits, the revealing thing is that NRA officials realize that responsible criticism cannot be shouted down by slashing attacks. Likewise it discloses the fact that the idea that the NRA is above reproach and that to criticize it is near-treason fortunately is fading away. It was inevitable that this would eventually come about.

Organization Getting Cumbersome

There are many critics of the NRA who are in sympathy with not only its purpose but with its general administration. Admitting it has made

mistakes, an admission readily conceded by General Johnson, this school of critics points out that it would be superhuman for it to steer clear entirely of errors. No fair-minded person is directing attack at the NRA simply for making mistakes.

There is, however, a growing criticism that it is branching out into so many activities that it threatens to become impossibly cumbersome, a titanic governmental organization sluggishly trying to keep in line the entire industrial fabric of the nation, a tremendously complicated set-up that no single organization could possibly handle efficiently. As time goes on the ramifications of the job multiply amazingly.

No better instance can be cited than that relating to the bituminous coal industry. Already parley after parley endlessly are being held to straighten out all sort of ills of the industry. Friction has developed over price-cutting, price relationships, divisional code and subdivisional code authority powers, freight absorptions, grading, etc., etc., some of the by-products brought to the surface by the code. Granting that the code may have aided the industry in stabilization, as it probably has, it has also created complications. Some officials even think nationalization of the coal industry, if not of all natural resource industries, is the only answer. This view comes from sources that are inherently opposed to Government ownership or any form of state socialism. Other industries are finding many problems under codes that remain to be solved.

Self-Government or Individualism

Supporters of the NRA say that it is a matter of "self-government" in industry, with "governmental guidance" or the much berated old system of "rugged individualism" or *laissez faire*. The latter collapsed, they contend. They insist that critics of the NRA should offer constructive suggestions and not simply "yap" at it. There are some critics who do simply "yap" at it. There are others, meaning to be constructive, who think that the NRA should go back to what apparently was the first intent. That is, to simply set up minimum wages, maximum hours, and simple trade practice rules. Then, they insist, industry should be allowed to go on its own. That, it is maintained, would be self-government by industry. As it is, the point is made that the codes, together with rules and regulations, are becoming so tremendously complicated and involved that unless there is a turn toward simplification the machinery will slow down, if it does not entirely stop.

It is feared also that the move to shorten the work week and increase wages is going to prove to be a monkey wrench in the machinery, as is the move to abolish the company union. These forces were again strongly rallied in the legislative program of organized labor leaders at the meeting here last week. These leaders, executive heads of the American Federation of Labor, probably do not expect to put through their program at this session of Congress, if at any future session, but certain it is they were given the blessing of many members of Congress. Among them was Senator Robert F. Wagner, chairman of the National Labor Board, who addressed the gathering and told the group that he believed in Government interference.

"The Government must see to it that you are on an equal footing with your employer," said the Senator.

Likewise, the Senator again declared hours must be reduced and wages increased in order to avoid social strife, one feature of the program adopted. He supported other features. Included in them are the proposed amendment to the Recovery Act giving labor representation on code authorities, creation of industrial boards with equal representation for labor and industry in all branches of industry; amendment to the collective bargaining section of the Recovery Act, giving protection for workers who organize into bona fide trade unions, an amendment barring corporations from using funds to organize company unions.

The program also would strengthen the National Labor Board and its regional boards, giving them sweeping power to subpoena witnesses, administer oaths and examine books, financial reports, etc., dealing with cases being investigated. Moreover, the Labor Board would be given mandatory power, under the proposed legislation, to hold elections under its supervision. This, no doubt, is aimed as an answer to those who have challenged the authority of the Board. Boiled down, organized labor is making an intense drive to unionize industry under the aegis of the NRA and it is making fast headway in that direction.

General Johnson has said he is convinced there will be no basic legislation affecting the NRA at this session, but that there might be some slight amendments. This probably reflects the general view. But organized labor will not permit failure of legislation at this session to stop its drive.

Manganese Producers' Code Gets Public Hearing

WASHINGTON, Jan. 30. — With full representation of domestic producers present, hearing was held last Friday on the NRA code of fair competition presented by the American Manganese Producers' Association, at which an amendment was offered to prohibit sale of imported ore below the prevailing price in the United States. Although strongly opposed to the program of the Association, no steel manufacturers attended the hearing to express their views.

The proceeding was held before Deputy Administrator W. A. Jenssen and the case of the domestic manganese ore producers was presented by their counsel, Bernard S. Barron of New York, who proposed the amendment to bar imports which are offered below domestic prices. In a petition which accompanied the code originally, the Association presented a petition asking the President to embargo manganese ore imports which they charged were being dumped into the United States. They also sought prohibition of imports from Russia, the chief source of the American supply, on the grounds that it was produced by convict labor. No mention of the petition was made at the hearing.

Expressing dissatisfaction over present protection afforded the domestic industry, amounting to 1c. per lb. of contained manganese, code sponsors said that in order to adhere to the maximum hours and minimum wage provisions of the code "ruthless and unfair foreign competition" must be curbed. If this is not done, Mr. Barron stated, "thousands of men will be denied employment and in the event of national emergency, national defense will be impaired, if not made impossible."

William H. Edmonds, speaking for the NRA Consumers' Advisory Board, asked that certain provisions of the fair trade section be struck out, claiming that there was an apparent attempt to suppress fair competition within the industry and a spirit "definitely opposed to consumers' interest." He expressed a desire to discuss provisions of the fair trade practice section with code proponents at a post-hearing conference.

Provisions of the code were read by J. Carl Adkerson, president of the American Manganese Producers' Association, and chairman of the code committee.

J. S. Gould, representing the NRA Labor Advisory Board, asked that employees receive one-and-one-half pay for overtime in place of the proposed one-and-one-third rate. He also attacked the 35c.-per-hour rate and urged that a definite differential be established between workers employed above and below the ground.

MAPI Code Hearing Feb. 9 Covers 39 Industrial Branches

WASHINGTON, Jan. 30. — Hearing on the code for the Machinery and Allied Products Industry will be held by Deputy Administrator H. O. King on Feb. 9. Sponsored by the Machinery and Allied Products Institute, claiming to represent 90 per cent of the industry, the code to include 39 or more supplemental codes. The code provides for a 40-hr. week with exceptions for peak or seasonal demands, when 48-hr. will be permitted and no limitations for employees on emergency, maintenance and repair work and for employees too highly skilled where restrictions of hours would unavoidably reduce or delay production.

A minimum hourly rate of 40c. is provided in the proposed case unless the rate per hour for the same work on July 15, 1929, was less, in which case the rate to be paid shall not be less than 35c.

Supplemental codes under MAPI are as follows:

Air Filter
Bakery Equipment Manufacturing
Beater & Jordan and Allied Equipment
Caster and Floor Truck Manufacturing
Cereal Machinery
Concrete Mixer
Contractors Pump
Conveyor and Material Preparation Equipment Manufacturing
Diamond Core Drill Manufacturing
Diesel Engine Manufacturing
Envelope Machine Manufacturing
Hair Clipper Manufacturing
Hoist Builders
Hoisting Engine Manufacturing
Hydraulic Machinery
Jack Manufacturing
Kiln, Cooler and Dryer Manufacturing
Locomotive Manufacturing
Mechanical Lubricator
Oil Field Pumping Engine Manufacturing
Power Transmission
Pulverizing Machinery and Equipment
Railway and Industrial Spring
Railway Appliance Manufacturing
Reduction Machinery
Refrigerating Machinery
Rock and Ore Crusher
Roller and Silent Chain
Rolling Mill Machinery and Equipment
Sawmill Machinery
Small Locomotive
Sprocket Chain
Steam Engine Manufacturing
Steel Tire Manufacturing
Water Meter Manufacturing
Waterpower Equipment (and three sub groups)
Water Softener and Filter
Wire Machinery
Woodworking Machinery

* * *

On Feb. 16 a hearing will be held before Deputy Administrator L. H. Peebles on the code for the tank car service industry. Formulae are set forth in the code for determining rental charges for tank cars, and it is made an unfair trade practice to cut rentals for tank cars below the code minimum.

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The code for the construction machinery distributing trade has been approved by President Roosevelt and will become effective Feb. 5.

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Results on an election conducted by the Cleveland Regional Labor Board for employees of the Cleveland Welding Co., according to an announcement of the National Labor Board, showed 163 votes for the International Association of Machinists and two votes for the "association," the title carried at the head of one column with spaces for writing in names. While no announcement to the effect was made by the Board it has been indicated that those favorable to the company union refrained from voting.

* * *

Workers in two captive coal mines, which had not reopened at the time the National Labor Board supervised elections in most of the captive coal mines, have petitioned the Board for elections since their mines had recently reopened. These were the Searight mine of the Republic Steel Corpn., and the Nemacolin Mines of the Buckeye Coal Co., subsidiary of the Youngstown Sheet & Tube Co. About 1500 miners are involved. Arrangements are being made by the National Labor Board to supervise the elections.

Stilwell Sees Better Selling Under Codes

"OLD time selling is dead" was the theme of a two-day sales conference held Jan. 25 and 26 at the Warner & Swasey Co., Cleveland machine tool manufacturer, where the company's representatives from all over the country gathered to discuss business conditions and the sales outlook for the year.

"Among the provisions of our code," said C. S. Stilwell, sales manager of the company, "as well as those of other industries, is one which permits frank discussion of a suitable price structure. The result has already been demonstrated in more uniform prices within our industry, and as a consequence less emphasis on the price element in selling. This presents the opportunity, as well as necessity, for a higher quality of salesmanship.

"Operation under the code is also helping to bring about a better quality of faith between competitors through clearer understanding of one another. This will eliminate the type of destructive selling formerly too prevalent in the industry. A desire on the part of men to sell the usefulness of machine tools, rather than merely to sell against a competitor, will make it possible for our industry to reap the benefits of an untouched market through creative selling.

"Other provisions of the code prevent the practice of ulterior methods in selling, such as cut prices, special undercover concessions, etc., and we believe the necessary adherence to these provisions, which are now a Federal law, opens the way completely to a development of the very highest type of selling."

C. & O. R. R. Asks Loan To Buy Cars

WASHINGTON, Jan. 30. — The Chesapeake & Ohio railroad has made application to the Interstate Commerce Commission for approval of a loan of $18,290,000 from the Public Works Administration to be used for the purchase of 7800 freight cars and 26 passenger cars. The loan has been allotted by the PWA.

The freight cars to be bought are to consist of 6000 50-ton steel hopper, 1000 50-ton steel gondola and 800 50-ton steel box cars. The passenger cars to be built are 15 steel coaches and 11 steel mail and express cars.

Intimates Strike Unless Weir Case is Pushed

WASHINGTON, Jan. 30.—A delegation from the Amalgamated Association of Iron, Steel and Tinworkers, led by William J. Long, president of the Weir Cove Lodge, is in Washington today to protest the delay in the Administration's handling of the Weir case.

A general walkout of steel workers throughout the country was intimated by the union delegation unless this case is settled to the satisfaction of union labor.

The White House is said to have announced that if the workers favor a new election, a Government supervised election will be held to decide whether Weirton employees shall deal with their employers through a company union or through the Amalgamated Association of Iron and Steel Workers.

Coast Guard Cutters To Be Built at Navy Yards

WASHINGTON, Jan. 30.—Private bids for the construction of seven Coast Guard cutters have been rejected and awards have been made to navy yards. Four will be built at Philadelphia, two at New York and one at Charleston, S. C. Originally bids were asked on nine vessels but later was reduced to seven.

British Iron and Steel Active, Tin Plate Continues Dull

LONDON, ENGLAND, Jan. 30 (*By Cable*).—Demand continues strong for British pig iron for home consumption. Quotations are as yet unchanged, although a price advance is warranted by increased costs and a shortage of fuel, which is delaying the lighting of more furnaces.

Steel production is gaining in activity as ship specifications are being more freely released. Rail mills also are busier.

The agreement between English and Continental makers of ship plates is now operating, although it is not yet signed. The National Federation of Iron and Steel Manufacturers will consider a plan for the reorganization of the British steel industry at its annual meeting next month.

Tin plate business is dull, but the market is steadier following meetings with Welsh and Continental tin plate makers to consider the regulation of export competition.

Continental iron and steel demand is improving, especially with United Kingdom Far and Near East possessions, but Dutch and British Indian business is restricted because of intensive Japanese competition.

International Steel Cartel reports show January bookings as far in excess of November.

Standard Shipping Co., New York, has ordered a 5000-ton oil tanker from the Furness Shipbuilding Co. South Africa will expend £600,000 on railway material, including 50 locomotives. Portugal is inviting bids for the new 6½-mile Tagus bridge.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9
Billets, open-hrth.	£5 10s. to £5 12s. 6d.
Tin plate, per base box	16s. to 16s. 6d.
Steel bars, open-hearth	£7 17½s. to £8 7½s.
Beams, open-hrth.	£7 7½s. to £7 17½s.
Channels, open-hearth	£7 12½s. to £8 2½s.
Angles, open-hearth	£7 7½s. to £7 17½s.
Black sheets, No. 24 gage	£9 5s.
Galvanized sheets, No. 24 gage	£11 5s. to £11 15s.

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £

Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain *franc* equivalent and then converting at present rate of dollar-franc exchange.

*Ingots	£2 5s.
*Billets, Thomas	£2 7s.
Wire rods, No. 5 B.W.G.	£4 10s.
*Steel bars, merchant	£3 2s. 6d.
*Sheet bars	£2 8s.
Plates, ¼ in. and up	£4 1s. 6d.
*Plates, 3/16 in. and 5 mm.	£4 3s. 6d.
*Sheets, ¼ in.	£4 8s. 6d.
*Ship plates	£4 10s.
*Beams, Thomas	£2 19s.
*Angles (basis)	£3 2s. 6d.
Hoops and strip steel over 6-in. base	£3 17s. 6d.
Wire, plain, No. 8	£5 7s. 6d.
Wire nails	£5 15s.
Wire, barbed, 4-pt. No. 10 B.W.G.	£8 15s.

*Prices as established by European Raw Steel Cartel.

Sees Opportunity for Road Machinery Exports

THROUGHOUT Europe there is a growing appreciation for the American methods of road building. George W. Farney, director, European Division American Road Builders' Association and vice-president National Highway Association, recently stated at Chicago that this fact is destined to call for large quantities of American made road building machinery as well as numerous opportunities for American engineers to engage in this work abroad. He urged that both engineers and road machinery builders immediately begin making contacts in Europe so that they will be in favorable position to participate in the opportunities that lie there.

German Iron and Steel Exports Decline

THE volume of Germany's foreign trade in iron and steel products declined in the 11 months ended November, 1933, as compared with the corresponding period of 1932, according to a report from Vice Consul J. H. Wright, Cologne, made public by the Commerce Department.

Total German iron and steel exports for the period January to November, 1933, amounted to 1,591,974 metric tons against 1,920,486 metric tons in the corresponding period of 1932.

Exports in the categories "tubes and rollers" and "railway superstructure material" showed increases in both quantity and value during the 1933 period, while increases in quantity but decreases in value are noted for "cutlery" and "tools and agricultural implements." Decreases in both quantity and value were registered for "shapes and rods," "plate and wire," "boilers; parts and accessories of machines," and "miscellaneous products."

German imports of iron and steel products during the first 11 months amounted to 699,729 metric tons compared with 500,235 metric tons during the corresponding period of 1932. Increases in value were registered in all categories except "miscellaneous products," while a slight decrease in quantity occurred under the classification "cutlery." The Saar District, the report points out, is the principal source of Germany's iron and steel imports.

Dr. Sprague Retained By General Motors

DR. O. M. W. SPRAGUE has been retained as advisor on problems relating to foreign economic and exchange matters, it was announced Monday by James D. Mooney, vice-president in charge of the overseas activities and interests of the General Motors Corpn. Dr. Sprague's broad experience in international monetary affairs and foreign trade places him in a position to render valuable services in an advisory capacity in connection with the many problems encountered in the overseas financial and commercial business of the General Motors Corporation, said Mr. Mooney.

U. S. Farm Equipment Exports Rise

AGAIN of 16 per cent was registered for United States exports of agricultural implements in 1933 compared with 1932, according to figures compiled in the Commerce Department's Machinery and Agricultural Implements division.

The value of 1933 shipments totaled $12,210,948 compared with $10,764,309 in 1932.

Increased exports during the closing months of the year, it is pointed out, accounted for the improved showing over the preceding year. Exports for the last half of the year were valued at $6,781,674 against $5,430,385 for the first six months.

December recorded the largest monthly export total for 1933, shipments in that month having a value of $1,446,639, an increase of 80 per cent over the December, 1932, total and 41 per cent over that for November, 1933.

Railroad Equipment

John Morrell & Co. have ordered 150 refrigerator cars from General American Car Co.

Pullman Car & Mfg. Corpn. has contracted to air-condition 15 cars for Seaboard Air Line, 58 for New York Central, 12 for Great Northern, 19 for Northern Pacific, and 480 sleeping cars for use on Chicago, Rock Island & Pacific, Seaboard Air Line, Pennsylvania, New York Central, Chicago, Burlington & Quincy, Great Northern, and Delaware, Lackawanna & Western.

Safety Car Heating & Lighting Co. is installing air-conditioning equipment in 26 passenger cars for Atchison, Topeka & Santa Fe.

▲▲▲ PERSONALS ▲▲▲

C. RAYMOND MESSINGER, chairman of the board, Chain Belt Co., Milwaukee, has resumed the office of president left vacant by the death of his brother, Clifford F. Messinger, who succeeded him as president when he was elected president of the Oliver Farm Equipment Co., with headquarters in Chicago, three years ago. Mr. Messinger has relinquished the presidency of the Oliver company and becomes chairman of the board, returning to Milwaukee to resume active direction of the Chain Belt Co. He is succeeded as president of the Oliver company by MILTON H. PETTIT, formerly an executive of the J. I. Case Threshing Machine Co., Racine, Wis.; Simmons Co., New York, and Nash Motors Co., Kenosha, Wis. More recently he has been associated with the National Recovery Administration in Washington.

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C. S. STILWELL, sales manager of Warner & Swasey Co., Cleveland machine tool builder, has been elected a director of the company. Mr. Stilwell has been with the company since his graduation from Denison University in 1912. After attending for one year the Apprentice School operated in the plant, he became a salesman in the Chicago office. From 1914 to 1930 he was district sales manager, with headquarters in Detroit. In the latter year he was transferred to Cleveland as sales manager.

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FORREST U. WEBSTER, advertising manager, Cutler-Hammer, Inc., Milwaukee, for the past seven years, has been advanced to manager of merchandising sales. He also will continue to exercise supervision over advertising. Mr. Webster is the immediate past-president of the National Industrial Advertisers Association.

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JOHN I. KITTS has been appointed representative in the North Central States, with headquarters in Duluth, by A. Milne & Co., New York.

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G. G. MCDONALD, who during the past 15 years has been sales representative in the Southern States for the Lake Erie Bolt & Nut Co., Bourne Fuller Co., and until recently for the Republic Steel Corpn., has been made general manager of sales of the Texas Nail & Wire Mfg. Co., Galveston, Tex.

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M. E. TEAGUE, for the past five years machine and tool representative of the Kirby Machine & Supply Co., has been made manager of the Toledo, Ohio, office of J. W. Mull, Jr., Indianapolis, Ind., production tool manufacturers' representative.

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FRANK M. YOUNG has been appointed Milwaukee agent, with offices at 2636 North Forty-eighth Street, for the Poole Foundry & Machine Co., Woodberry, Md.

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BENNETT CHAPPLE, vice-president of the American Rolling Mill Co., Middletown, Ohio, will be one of the speakers at the annual convention of the American Ceramic Society in Cincinnati, Feb. 11 to 16. He will discuss the application of ceramic products as exteriors for metal buildings.

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GEORGE K. VIALL has been elected a director of the Chain Belt Co., to fill the vacancy caused by the death of Clifford F. Messinger. He became associated with the company in 1921 as assistant to the president, later becoming works manager and more recently a vice-president.

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ALBERT J. VITS, executive vice-president, Aluminum Goods Mfg. Co., Manitowoc, Wis., has been elected president to fill the vacancy caused by the death of his brother, George Vits. HUGO L. VITS, vice-president and general superintendent, has been elected to the board of directors.

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W. DEAN CUNNYNGHAM has been made representative in the South, with headquarters at the Hotel Patten, Chattanooga, Tenn., by A. Milne & Co., New York.

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H. J. FREYN, president of the Freyn Engineering Co., Chicago, consulting engineer, has been elected chairman of the board. WYMAN EATON, formerly vice-president, has been made president, and GORDON FOX, formerly power engineer, has been named a vice-president. ALFRED J. EBENER has also been named a vice-president and L. T. SHORLEY has been reelected secretary and treasurer.

▲▲ OBITUARY ▲▲

CHARLES F. LANG, former president, Lakewood Engineering Co., Cleveland, died in that city Jan. 24, aged 62 years. He became connected with the company in 1906 and later was chosen as its head, remaining in this capacity until the company was consolidated with the Yaeger Machine Co., Columbus, Ohio.

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WILEY J. DUNHAM, former president of Dunham Co., Berea, Ohio, operator of a jobbing foundry and manufacturers of lawn rollers and small agricultural tools, died Jan. 22, in Lauderdale, Fla., where he was spending the winter.

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CHARLES J. SNOW, treasurer, Bruce-Macbeth Engine Co., Cleveland, died Jan. 22, aged 66 years. He was one of the organizers in 1901 of the Macbeth Iron Co., which later became the Bruce-Macbeth Co.

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JOSEPH SKOBIS, founder and for many years president of the Skobis Co., Milwaukee, structural steel fabricator, died Jan. 25, aged 73 years. He retired several years ago. His brother, JAMES SKOBIS, who also was a founder of the concern, died Jan. 18, aged 79 years.

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PAUL MAEHLER, president of the Paul Maehler Co., Chicago, sheet metal concern, died of pneumonia on Jan. 24. He was 69 years old and had been a resident of Chicago for 48 years.

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WILLIAM TORRANCE, SR., president of John Torrance & Son, LaCrosse, Wis., manufacturers of castings, fabricators of structural and architectural steel products, died Jan. 21, aged 76 years. The firm was established in 1877 in association with his father, John Torrance, who died in 1897. William Torrance was born in Adairville, Ky., Jan. 24, 1857. The family settled in LaCrosse two years later.

Pipe Lines

Montana-Dakota Power Co., Minneapolis, plans welded steel pipe line from Williston, N. D., to Minot, N. D., in cooperation with last noted city. Company has made proposition that Minot arrange financing through Federal aid for $1,523,000 for proposed line for natural gas service, with company handling principal and interest each year until loan is paid. J. E. McKoane, Minot, is head of municipal committee in charge.

San Luis Obispo County Water District No. 3, Cambria, Cal., plans 2 to 4-in. standard steel pipe for water system. Fund of $24,000 has been secured through Federal aid.

Zachary, La., has arranged Federal financing for $16,000 for steel pipe line for municipal natural gas.

Tacoma, Wash., plans early call for bids for 42-in. and larger steel pipe line, for main water supply and head works on Green River. Fund of $1,000,000 has been arranged through Federal aid. W. A. Kunick is water superintendent.

Tarpon Springs, Fla., plans about 1200 ft. of 4-in. and 50,000 ft. of 2-in. steel pipe for municipal gas supply and distribution system. Financing for $75,000 is being arranged for this and gas plant.

Santa Maria Reservoir Co., Creede, Colo., care of Royce J. Tipton, First National Bank Building, Denver, engineer, plans 84-in. pipe line, steel, concrete or wood stave (alternate bids to be asked) for syphon installation, totaling 8250 ft., near Creede.

Coast Steel Trades To Meet

THE tenth annual conference of the Iron, Steel and Allied Industries of California will be held at Hotel Del Monte, Del Monte, Cal., on Feb. 8, 9 and 10. The opening meeting on Thursday will be addressed by W. A. Irvin, president, United States Steel Corpn., V. G. Iden, acting secretary, American Institute of Steel Construction, New York, and A. F. Hockenbeamer, president, Pacific Gas & Electric Co., San Francisco. An open forum will be held on Thursday afternoon, with discussion focused on "Trade Association Leadership" and "Government Assistance Necessary to Help Trade Associations Enforce NRA Codes."

Group meetings of structural shops, reinforcing steel dealers, merchant steel dealers, sellers and users of tubular products, and of manufacturers, traffic managers and purchasing agents are scheduled for Thursday evening and Friday morning. On Friday also "Cooperation of the Purchasing Agents" will be discussed by Charles A. Kelly, president, Purchasing Agents Association of Southern California, and H. Lee Weber, president, Purchasing Agents Association of Northern California, while "The New Deal in Merchandising" will be the topic of Joseph V. Smith, vice-president, Hubbard & Co., Pittsburgh, Pa.

Recent Developments In Refractories

WHILE fire-clay brick and sand bottoms still are extensively used in metallurgical furnaces, new materials, particularly chrome compounds, are rapidly gaining favor in this field. The advantage of the chromes, according to the Quigley Co., Inc., New York, is that they give longer life, greater resistance to abrasion and to slagging action, and usually produce cleaner billets. This company has developed a furnace bottom refractory known as "Heart-crete," and reports recent installations in more than 150 plants. Some of the advantages claimed for Hearth-crete are chemical and mechanical stability at operating temperatures, and ease of installation. The material comes to the user in dry form and is mixed with water on the job and then merely put in place and troweled smooth in as simple and quick a manner as would be the case with ordinary concrete.

Another new material known as "firecrete" has been developed by the Johns-Manville Corpn., New York. This material also is handled like ordinary concrete and is intended for use with temperatures up to 2800 deg. F. It is said to be well suited for casting into special shapes.

The General Refractories Co. reports the development of special equipment for producing the recent intricate shapes of stove brick, and states that denser and more refractory stove brick are now available for top courses where greater resistance to alkali slag attack and vitrification is necessary. An important new field of activity reported by this company is the insulating of open-hearth furnaces for thermal economy. The company states that silica brick were successfully displaced from the roof of a large copper smelting reverberatory furnace by a suspended construction utilizing hydraulically pressed unburned magnesite brick.

Program of Mining and Metallurgical Engineers

THE American Institute of Mining and Metallurgical Engineers will hold its one hundred forty-third meeting in the Engineering Societies Building, 29 West Thirty-ninth Street, New York, Feb. 19 to 22. At the annual dinner and reception to be held at Hotel Commodore, the William Lawrence Saunders medal will be presented to Pope Yeatman, and the Robert W. Hunt prize awarded to Dr. Cyril Stanley Smith and Earl W. Palmer.

The preliminary list of papers has been published, which is available from the secretary of the institute. Of particular interest to the iron and steel industry are the programs of the iron and steel division, and the institute of metals division.

For the Tuesday program there are papers by John Laurence Burns, Robert F. Mehl and colleagues (two papers), A. O. Knight and Helmut Muller-Stock, I. N. Zaverine, and N. A. Ziegler. The papers by Dr. Mehl et al. are parts V and VI of their series of studies upon the Widmanstätten structure. For the Wednesday morning session there is a paper on chromium-nickel steels containing columbium, by F. M. Becket and R. Franks, and another on the determination of oxygen in alloy steels and its effect upon tube piercing, by Newell Hamilton. Thomas T. Read, Vinton professor of mining engineering, Columbia University, will deliver the illustrated lecture Wednesday afternoon. His subject will be "Ancient Cast Iron." Dr. F. N. Speller of National Tube Co., Pittsburgh, will deliver the Howe memorial lecture. Papers by T. D. Yensen and C. H. Herty, Jr., W. J. Reagan, and T. E. Brower, B. M. Larsen and W. E. Shenk will be presented at the open-hearth session on Thursday morning.

At the various technical sessions on Tuesday afternoon and Wednesday morning and afternoon there will be presented a total of eleven papers dealing variously with the internal stresses in quenched aluminum and some aluminum alloys, the drawing properties of rolled zinc alloys, the creep of metals, the lithium-magnesium equilibrium diagram, X-ray studies on the nickel-chromium system and on the gold-iron alloys, crystal orientations of cold-rolled alloyed zinc, the influence of silver on the softening of cold-worked copper, the solubility of oxygen in solid copper, and the strength and aging characteristics of the nickel bronzes. The annual dinner of the division will be held Tuesday evening at the Commodore Hotel.

A report on "Non-metallic Elements in Metals," by T. D. Yensen and C. H. Herty, Jr., will be presented to an open-hearth session of the iron and steel division on Thursday morning. At 4 o'clock, Thursday afternoon, in the auditorium, Prof. L. W. McKeehan, director of the Sloane Physics Laboratory, Yale University, will deliver the annual lecture, the title of which is "Ferromagnetism in Metallic Crystals."

Connersville Blower Co. Changes Name

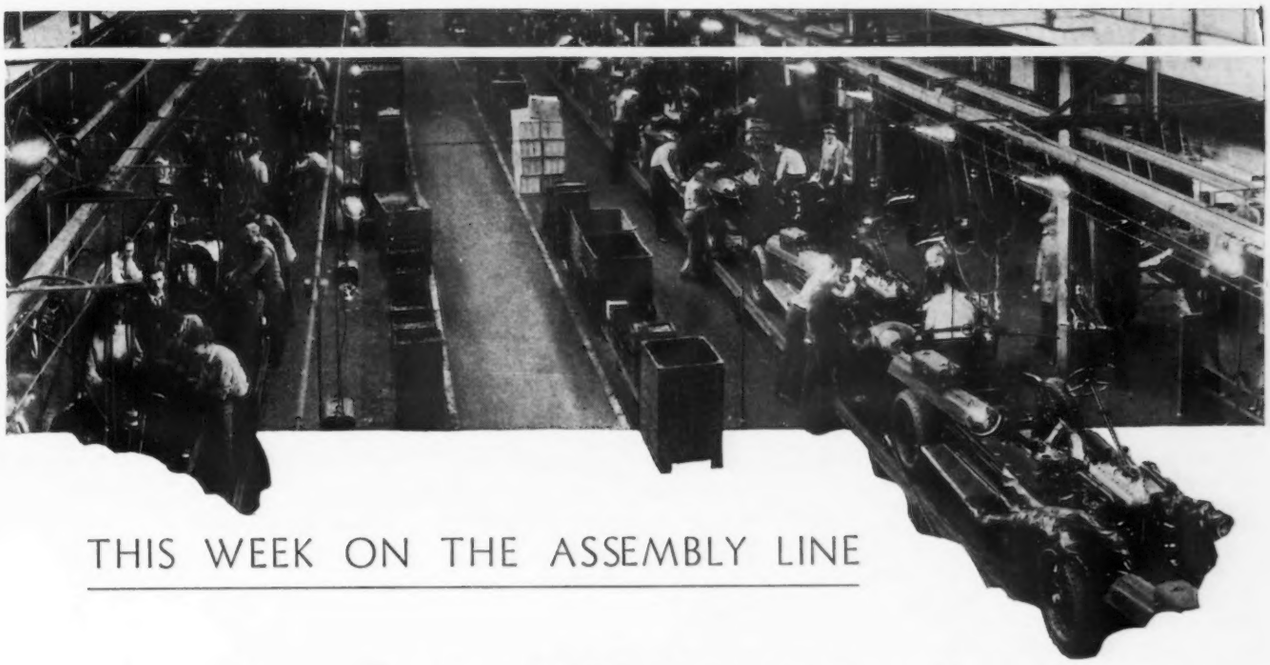
AT the annual meeting of the stockholders of The Connersville Blower Co., Inc., held on Jan. 23, 1934, action was taken to change the name of the company to Roots-Connersville Blower Corpn.

The management of the company will continue as heretofore, without any change in personnel. The officers are: L. J. Brown, chairman of the board; J. S. Tatman, president; B. C. O'Brien, 1st vice-president; G. W. Ansted, 2nd vice-president; W. E. Newkirk, treasurer, and Emery Huston, secretary. The board of directors, in addition to Messrs. Brown, Tatman, O'Brien and Ansted, includes the following: F. S. Heath, E. D. Johnston, Wayne Stacey, C. A. Thompson, and Joseph M. Wilkin.

One of the units now comprising Roots-Connersville Blower Corpn. dates back to 1854, and all have engaged in building the same line of equipment for many years, including rotary positive blowers, gas pumps, gas meters, liquid and vacuum pumps, etc. Within recent years, a complete line of centrifugal pumps and blowers, based on designs perfected during many years of experience of engineers now connected with the company, has been introduced. More recently still, a line of turbine pumps, designed to handle comparatively small quantities of liquids, at heads up to 300 feet and higher, was announced to the trade.

New Pig Iron Prices At Jackson

NEW prices f.o.b. Jackson, Ohio, have been filed as follows: Basic pig iron, $18.75 a ton; foundry pig iron, $19.25; malleable pig iron, $19.25.



THIS WEEK ON THE ASSEMBLY LINE

Large Steel Orders Placed As Production Is Speeded

DETROIT, JAN. 30.

WITH retail orders continuing to pile up, automobile executives have given to their manufacturing departments the signal of full speed ahead in an endeavor to catch up with retail demand and to stock dealers with new models.

The result has been the most momentous week in the industry in several years. The mobilization of men and materials has been on such a massive scale as to thrill even the most callous observer. Employment has increased like magic, flat-rolled steel mills have been submerged in an avalanche of orders, automotive purchasing departments are directing all their energies toward getting deliveries of as large a volume as possible of parts and raw materials in the next few weeks.

Tentative production schedules, which are believed beyond attainment the coming month, sound like a repetition of the golden days of '28. Ford has reached 4000 cars a day on its way up to the 5000 mark, a goal which it has not attained since depression struck the United States. General Motors is shooting at a total of 125,000 units as a minimum in February and will go as far beyond that as expansion of production permits. Chrysler hopes to get up to 70,500 units in February and push on farther to 92,000 in March.

The sharp gain in assemblies the past week probably insured a January total of 150,000 units, and it now appears that the February output will be 225,000 with a fair chance that it will rise to 250,000. It seems certain that March will go considerably past 300,000 units, production for that month promising to be within striking distance of the 368,106 units turned out in the entire first quarter of last year.

That these figures are no idle promises is shown by the sharp jump in automotive employment. In metropolitan Detroit alone industrial employment today stands at 245,000 workers, an increase of 75,000 over the corresponding period of 1933. To this number can be added 80,000 men in other southern Michigan cities, including Pontiac, Flint, Jackson and Lansing.

Chevrolet's employment today is 50,816 men, as against about 31,000 a year ago. General Motors as a whole has a factory payroll of 158,000 men, or 33,000 more than in January of last year. The Ford Motor Co., in its 10 active assembly plants and at Dearborn, has a working force of over 90,000. Chrysler's various divisions are employing 43,000 men, compared with 22,000 at this time in 1933. The smaller automobile companies have had a corresponding gain in employment.

Says John L. Lovett, general manager of the Michigan Manufacturers' Association, "For the next five months at least the automobile industry should absorb nearly all of its idle workers."

Shortage of Skilled Help

The fact is that a growing shortage of highly skilled help exists in Detroit. The situation is particularly acute among metal polishers, metal finishers, welders and other skilled workmen who fall under the general classification of "body tradesmen." A similar situation threatens among skilled machine operators, such as automatic screw machine operators.

There is one important limiting factor on production. If some of the major companies expect to achieve the manufacturing performance about which they now are talking, they will have to buy additional high-speed machine tools, as a mere increase in manpower with their present machine equipment will not turn the trick. And unfortunately machine tools can't be bought and delivered over the counter *instanter* like a loaf of bread. They take three or four weeks to build.

Ford is still capitalizing handsomely on its position of being the only low-price maker who can deliver cars to customers promptly. It will be recalled that the Rouge plant was tooled up more than a year ago for production of both the large model 40 and a smaller model 44. The latter car has been brought into the spotlight and then shoved back into the background so many times that the

tracing of its course became wearisome.

It is well established today that the success of the present V-eight has been so notable that model 44 has been shelved indefinitely. Plant equipment tooled up for its production has been hastily changed over to permit expansion of work on the current model. All of the energies of the far-flung Ford organization are being bent to the single task of manufacturing and selling the car introduced early in December.

It is understood that about 700 to 800 V-eight cylinder blocks are being made daily for Ford by the Campbell, Wyant & Cannon foundry at Muskegon, Mich. If Ford has a bottle-neck at the Rouge plant, it is said to be its limited facilities for turning out radiator shells, especially for chromium plating them. It is only in the last two years that Ford has gone over to a chromium-plated shell from rustless steel. Ford is reported to have plans afoot for increasing its chrome plating capacity in the immediate future.

Ford is now in the process of unleashing its heaviest sales guns. It goes on the air twice a week beginning Feb. 4 in its first factory-sponsored radio advertising program. Its dealers will conduct an extensive advertising campaign distinct from that of the factory in the 32 branch territories throughout the United States. A special effort is being made by Ford to recover lost ground in the commercial car and truck field in which it has marked down prices $20 to $40 in contrast with an increase of $5 to $30 in passenger cars.

Accepting the Ford challenge to its leadership in commercial cars and trucks, Chevrolet declares that its estimates for production and sales in that division will be far exceeded this year. In 1933 it sold 103,000 units. Its assemblies of trucks this month will be 25,000 units. A like schedule probably will be maintained in February, March and April.

Chevrolet Overcoming Difficulties

Chevrolet is said to be rapidly overcoming its difficulties in connection with the construction of its front-end units, perhaps the most vexing single problem having involved the welding of the steel housing inclosing the coil springs. This problem has been solved by creation of a new, ingenious welding process.

On Jan. 24 Chevrolet assembled 2141 cars and trucks, and it hopes to boost the daily rate this week to 3000. The local gear and axle plant is reported to have 135,000 units scheduled for February to be delivered to Chevrolet and Pontiac, but it appears questionable whether such a total can be attained. Chevrolet is aiming at assembly of about 60,000 passenger cars and 25,000 trucks in February.

Preparing its dealers for an active season of service business, Chevrolet has been ordering stocks of small parts almost in production volume.

Other General Motors divisions are going ahead at a more rapid pace, with Pontiac and Oldsmobile each counting on 15,000 cars next month. Buick probably will continue at about 9000 units monthly. Cadillac is seriously handicapped by delays in securing dies, with production of the new LaSalle probably not getting well under way until close to March 1.

Plymouth To Make 42,000 Units in February

As for Chrysler, the Plymouth division is up to 1200 cars a day and Dodge about 300. Plymouth has received orders from dealers for 45,481 cars and is trying to push up its output to 42,000 units in February, and even more if possible. Dodge has booked orders for 17,000 passenger cars and 6000 trucks. Plymouth dealers had sufficient cars on hand to show new models for the first time last week-end.

The first De Soto came off the line the past week. Assemblies of De Sotos and Airflow Chryslers probably will be irregular for several weeks. Chrysler Corpn. claims dealers' orders on hand for fifty million dollars' worth of new models. Chrysler hopes to be making 3000 units a day by Feb. 15, already having passed the 2000 mark.

Hudson-Terraplane increased production considerably the past week, but still is lagging behind orders, which are said to total 24,000. Auburn is reported to be down until early in February. It has announced that it will introduce later in the year a car of radically new design under a new name. Inasmuch as Auburn intends to wait to see how the public wind blows on such subjects as airflow design and independent wheel suspension, this car probably will not be on the market until the summer or early fall.

Steel circles were energized the past week by the rush of motor car companies to cover all of their first quarter flat-rolled steel requirements. Each buyer apparently realized at the same time that it might be left without steel at a crucial moment in the final month of the quarter unless it gave releases to the mills immediately. Accordingly a flood of business was precipitated in sheets and strip steel, particularly in wide sheets in which manufacturing capacity is limited.

One of the steel offices in Detroit reported the largest single week's bookings in its history, and one of the smaller sheet mills is booked to capacity during the remainder of this quarter. Still another mill specializing on automotive requirements expects to be sold out for the quarter within another week.

This steel buying movement has not been confined to any one automobile maker, but has been freely participated in by General Motors' divisions, Chrysler and Ford as well as the smaller manufacturers. Apparently the threat of increased prices in the second quarter had little to do with the sudden decisions to give heavy steel releases; today the matter of securing deliveries transcends price in the minds of automotive steel buyers.

The influx of orders has rocketed district sheet and strip mill operations to 100 per cent of capacity.

Steel bar makers have had more liberal business the past week, but have not felt the impetus of an upswing comparable with that in flat-rolled steel. This is accounted for by the fact that forging steel was stocked in larger quantities than sheets because it is not subject to serious deterioration.

Buick has let some contracts for tools and dies for its smaller car. Total expenditures for this purpose, however, are understood to be less than originally estimated because many parts in the new car will be interchangeable with those in the present Buick model 51, the lowest priced of the current Buick series.

Independent Springing Explained

The Dubonnet system of independent springing was adopted by Chevrolet in preference to the design developed by Cadillac because of the much lighter weight of the Chevrolet car, said J. W. Crawford, Chevrolet's chief engineer, at a symposium on independent springing at the annual S.A.E. meeting in Detroit last week. It also was important for Chevrolet to adopt a system the units of which could be manufactured and assembled in one plant and then shipped to branch plants for assembly to the chassis. These units also can be quickly replaced in service when necessary.

In explanation of Chrysler's reason for putting coil springs on the Plymouth, Dodge and Chrysler six and retaining leaf springs on the Airflow De Sotos and Chryslers, Tore Franzen of the Chrysler Corpn. said that in the case of larger models excellent riding could be secured by the change in weight distribution effected by moving the engine further forward. The inference would seem to be that if the Airflow design is a success and other makers adopt this principle, coil springs will disappear from use as fast as they came into prominence.

Because of the sharp expansion in its production, the Ford Motor Co. is expected shortly to light its second blast furnace at the Rouge plant. It has been several years since Ford operations have attained sufficiently large proportions to keep its two furnaces busy. This is considered a forerunner of a further stepping up of production in its open-hearth steel department.

Automobile Releases Drive Up Operations to 35 Per Cent

Some Sheet and Strip Mills Sold Out for First Quarter—Protest Against Code Seen in Manner Orders Were Distributed

THE first shot in what may prove to be a stirring battle between consumers and producers of steel has been fired by a large automobile manufacturer. Dissatisfied with the steel code and particularly with provisions barring preferential prices on large purchases, this company is reported to have sharply reduced tonnages allotted to leading steel companies and to have spread out its orders among a large number of small mills. This move, intended also as a protest against prospective price advances for the second quarter, comes at a time when the automotive industry stands alone among the foremost consuming lines as a source of rapidly increasing tonnage. The campaign has been supplemented by negotiations for the purchase of one of the smaller Central Western steel companies, and follows recent pressure against stainless steel prices which was accompanied by threats to return to the use of chromium plating.

The drive of the automobile industry to win back preferential prices comes at a time when the steel code is being attacked at Washington for discriminating against smaller industries. Steel producers obviously cannot please both large and small buyers, but complaints on the part of smaller interests are surprising in view of the code provision for price equality among all classes of consumers irrespective of size.

THE automotive industry has placed large orders within the past week, with the result that certain producers of sheets and strips are sold out for the remainder of this quarter. Steel output has been stimulated, particularly in centers specializing in the lighter rolled products. The Valley rate has risen five points to 35 per cent of capacity and may reach 40 per cent before the close of this week. Operations in the Wheeling district are up 10 points to 60 per cent and the Chicago average has risen one point to 30½ per cent. The rate in the Cleveland-Lorain area remains at 54 per cent but is due to rise within the next seven days. In Pittsburgh, where heavy products predominate, mills are having difficulty in maintaining a 21 per cent rate. In the Philadelphia district ingot output is off two points to 23 per cent. The national average has risen three points to 35 per cent of capacity, the highest rate to date this year.

TONNAGE from the railroads is still slow in materializing, largely because of prolonged financial negotiations at Washington. The Pennsylvania will take bids Feb. 5 on 22,350 tons of plates, shapes, bars and sheets. Orders for 12,775 cars for the Van Sweringen roads will be placed shortly. However, it is doubtful whether the steel required for these cars, amounting to 160,000 to 175,000 tons, will reach mills before late February or early March.

The public works program, so long in getting into full swing, promises to give the iron and steel industry substantial support sooner than the railroads. Structural steel awards, at 18,800 tons, were the second largest reported this year, and compare with 11,550 tons a week ago. New projects of 15,725 tons compare with 5450 tons in the previous week and 14,250 tons two weeks ago. Lettings reported in January totaled 60,890 tons, as against 79,925 tons in December and 80,275 tons in November.

Cast-iron pipe has felt the impetus of Federal aid perhaps more than structural steel. Following closely on an award of 6000 tons by Providence, R. I., an equal tonnage has been placed by Hialeah, Miami, Fla., and 1600 tons has been let by St. Johnsboro, Vt. Boston has received tenders on 2450 tons and San Juan, Porto Rico, has taken bids on 8400 tons.

SCRAP, ordinarily a good barometer of steel production, has weakened in price just as steel mill operations seem headed for further gains. THE IRON AGE composite for heavy melting steel has declined from $12 to $11.92 a gross ton, following nine consecutive weekly advances. The reduction is due entirely to weakness at Pittsburgh, where distress material has temporarily driven down the market in the face of favorable long-range prospects.

The finished steel and pig iron composites remain unchanged at 2.028c. a lb. and $16.90 a gross ton. Some substantial purchases of both steel and pig iron have been made in anticipation of an upswing in prices following dollar devaluation. Other buying has been stimulated by the fear that there may be a congestion of late specifications, rendering it difficult to obtain complete shipments of quarterly requirements by March 31.

Another market factor influencing both pig iron and steel buyers is the persistence of reports of impending advances. Increases in sheet prices are most commonly expected. Sheet producing costs have gone up $11 a ton since last April, or considerably more than the average advance in price, it is pointed out.

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▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Jan. 30, 1934	Jan. 23, 1934	Jan. 2, 1934	Jan. 31, 1933
Per Gross Ton:				
No. 2 fdy., Philadelphia	$19.26	$19.26	$19.26	$13.34
No. 2, Valley furnace	17.50	17.50	17.50	14.50
No. 2 Southern, Cin'ti	18.13	18.13	18.13	13.82
No. 2, Birmingham†	13.50	13.50	13.50	11.00
No. 2 foundry, Chicago*	17.50	17.50	17.50	15.50
Basic, del'd eastern Pa.	18.76	18.76	18.76	13.50
Basic, Valley furnace	17.00	17.00	17.00	13.50
Valley Bessemer, del'd P'gh.	19.76	19.76	19.76	16.89
Malleable, Chicago*	17.50	17.50	17.50	15.50
Malleable, Valley	17.50	17.50	17.50	14.50
L. S. charcoal, Chicago	23.54	23.54	23.54	23.17
Ferromanganese, seab'd carlots	85.00	85.00	85.00	68.00

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
†This quotation is for delivery in South; in the North prices are 38c. a ton under delivered quotations from nearest Northern furnace.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$36.37½	$36.37½	$36.37½	$40.00
Light rails, Pittsburgh	32.00	32.00	32.00	30.00
Rerolling billets, Pittsburgh	26.00	26.00	26.00	26.00
Sheet bars, Pittsburgh	26.00	26.00	26.00	26.00
Slabs, Pittsburgh	26.00	26.00	26.00	26.00
Forging billets, Pittsburgh	31.00	31.00	31.00	31.00
Wire rods, Pittsburgh	36.00	36.00	36.00	35.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.60	1.60

Finished Steel

Per Lb.:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.75	1.75	1.75	1.60
Bars, Chicago	1.80	1.80	1.80	1.70
Bars, Cleveland	1.80	1.80	1.80	1.65
Bars, New York	2.08	2.08	2.08	1.95
Plates, Pittsburgh	1.70	1.70	1.70	1.60
Plates, Chicago	1.75	1.75	1.75	1.70
Plates, New York	1.98	1.98	1.98	1.698
Structural shapes, Pittsburgh	1.70	1.70	1.70	1.60
Structural shapes, Chicago	1.75	1.75	1.75	1.70
Structural shapes, New York	1.95¼	1.95¼	1.95¼	1.86775
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	1.70
Hot-rolled strips, Pittsburgh	1.75	1.75	1.75	1.45
Cold-rolled strips, Pittsburgh	2.40	2.40	2.40	1.80

Finished Steel

Per Lb.:	Jan. 30, 1934 Cents	Jan. 23, 1934 Cents	Jan. 2, 1934 Cents	Jan. 31, 1933 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.25	2.25	2.25	2.00
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.35	2.35	2.35	2.10
Sheets, galv., No. 24, P'gh	2.85	2.85	2.85	2.50
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.95	2.60
Hot-rolled sheets, No. 10, P'gh	1.75	1.75	1.75	1.45
Hot-rolled sheets No. 10, Chicago dist. mill	1.85	1.85	1.85	1.55
Wire nails, Pittsburgh	2.35	2.35	2.35	1.80
Wire nails, Chicago dist. mill	2.40	2.40	2.40	1.85
Plain wire, Pittsburgh	2.20	2.20	2.20	2.10
Plain wire, Chicago, dist. mill	2.25	2.25	2.25	2.15
Barbed wire, galv., P'gh	2.85	2.85	2.85	2.30
Barbed wire, galv., Chicago dist. mill	2.90	2.90	2.90	2.35
Tin plate, 100 lb. box, P'gh.	$5.25	$5.25	$5.25	$4.25

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$13.25	$13.50	$12.50	$8.25
Heavy melting steel, Phila.	11.75	11.75	11.50	6.75
Heavy melting steel, Ch'go	10.75	10.75	10.00	5.25
Carwheels, Chicago	11.00	11.00	10.00	7.50
Carwheels, Philadelphia	12.75	12.75	11.75	8.00
No. 1 cast, Pittsburgh	12.25	11.75	11.25	9.00
No. 1 cast, Philadelphia	12.50	12.50	12.50	8.00
No. 1 cast, Ch'go (net ton)	9.50	9.50	9.50	6.25
No. 1 RR. wrot., Phila.	11.00	11.00	11.00	7.50
No. 1 RR. wrot., Ch'go (net)	9.25	9.25	8.75	4.50

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.50	$3.50	$3.75	$1.75
Foundry coke, prompt	4.25	4.25	4.25	2.50

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, refinery	8.00	8.12½	8.00	4.75
Lake copper, New York	8.25	8.37½	8.25	5.00
Tin (Straits), New York	51.62½	51.62½	53.25	23.50
Zinc, East St. Louis	4.30	4.25	4.35	2.87½
Zinc, New York	4.65	4.60	4.70	3.24½
Lead, St. Louis	3.90	3.90	3.90	2.87½
Lead, New York	4.00	4.00	4.00	3.00
Antimony (Asiatic), N. Y.	7.15	7.20	7.25	5.80

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

▲ ▲ ▲

▲▲▲ The Iron Age Composite Prices ▲▲▲

	Finished Steel	Pig Iron	Steel Scrap
Jan. 30, 1934	2.028c. a Lb.	$16.90 a Gross Ton	$11.92 a Gross Ton
One week ago	2.028c.	16.90	12.00
One month ago	2.028c.	16.90	11.33
One year ago	1.923c.	13.56	6.75
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1933	2.036c., Oct. 3	1.867c., Apr. 18	$16.90, Dec. 5	$13.56, Jan. 3	$12.25, Aug. 8	$6.75, Jan. 3
1932	1.977c., Oct. 4	1.926c., Feb. 2	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.42, July 5
1931	2.037c., Jan. 13	1.945c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.273c., Jan. 7	2.018c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.317c., April 2	2.273c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.286c., Dec. 11	2.217c., July 17	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22

Steel Output Fails to Gain at Pittsburgh

But Operations Improve in Youngstown and Wheeling Districts—Scrap Market Is Temporarily Easier

PITTSBURGH, Jan. 30.—In spite of an improved demand for sheet and strip steel in this district, aggregate orders for finished steel products have failed to show any general improvement and business remains rather quiet. The increased movement of sheets and strip is almost entirely traceable to automotive parts makers, with automobile manufacturers still deferring their needs.

Demand from other major steel outlets continues to be delayed. Car builders have submitted bids for nearly 13,000 freight cars for the Van Sweringen roads, but some delay may be encountered in the placing of orders, and the required steel may not reach mills before March. Steel purchases for freight car building by the Pennsylvania are also delayed by code technicalities. Other business from the railroads seems no nearer to mill order books than heretofore. Construction projects are still lagging, and work on existing jobs has been practically halted this week by extreme cold weather. Tin plate specifications show no improvement, and mills have stocked as much material as they care to in most instances.

Steel ingot production in the district is barely holding its own at 21 per cent of capacity, with a sharp decline in the operations of one large company being offset by gains among the smaller independents. The leading interest is just about holding its own. A steel works blast furnace has been banked.

Valley production has already risen to 35 per cent of capacity, and may reach 40 per cent before the end of the week. Wheeling district activity is estimated at 60 per cent of capacity.

It can thus be seen that the preponderance of heavy products capacity in the immediate Pittsburgh district is holding it back when compared with nearby steel producing areas in which flat-rolled products predominate. However, the situation would soon be corrected by the release of railroad and construction tonnages.

The pig iron market continues very quiet, with scarcely any buying reported. Scrap is weaker following its recent sharp rise, but the situation is affected by distress offerings of small dealers and is believed to be only temporary.

Pig Iron

Demand for iron shows little improvement in this district, with foundry melt continuing at a low level. Business in steel castings is featured by the requirements of lock and dam construction on the Ohio and Mississippi rivers, which will eventually bring considerable tonnage to nearby furnaces. Large consumers of basic iron in the district are fairly well stocked, and show no disposition to make commitments.

Semi-Finished Steel

Shipments this month have fallen sharply under the comparatively high December rate, and no improvement is in immediate prospect. Sheet and strip mills are taking larger quantities than was the case earlier in the year, but the requirements of tin plate producers are still definitely limited. Forging billets are in fair demand, but wire rods are dull.

Rails and Track Accessories

Purchases by the railroads continue to be held up by financial litigation at Washington. No large inquiries for either rails or track accessories have appeared, and the local rail mill has not received sufficient releases against tonnage already booked to warrant its operation.

Bars

Demand for hot-rolled bars is still rather quiet, with the requirements of most users confined to small fill-in lots for immediate shipment. Alloy steel bars are moving to the automotive industry in slightly better volume, but demand is by no means up to expectations. Movement of reinforcing bars is hampered by the extreme cold weather in the greater part of the country, which has temporarily halted construction work of all kinds. The Calvert Street bridge at Washington will take 700 tons of reinforcing bars.

Cold-Finished Steel Bars

With demand from the automotive industry improving only slightly, the cold-finished bar market remains dull. Jobbers are well stocked and have not begun to move enough material to warrant additional purchases for at least another month.

Plates and Shapes

This market continues to await substantial purchases for railroad freight cars. The Van Sweringen roads have not yet awarded the 12,775 freight cars for which bids were taken last week, and another month may elapse before the steel tonnage required will reach mills. A technicality has arisen in connection with the inquiry for 21,000 tons of rolled steel to be required for freight cars to be built by the Pennsylvania Railroad. The bids are not asked by the railroad itself, and a ruling by the American Iron and Steel Institute will be required to see if the business can be awarded under Resolution 29 of the iron and steel code. The inquiry also calls for 18,000 car wheels and 3000 axles. No other large car construction programs are before mills in this district, but some additional business is expected to develop this month.

Structural steel awards continue light, although the estimating departments of local fabricating shops are very busy. While public works jobs predominate in new inquiries, a little private construction is before the trade. A bridge over the Chop Tank River at Cambridge, Md., will require 5000 tons, while the Illinois Central is taking bids on 3800 tons for a viaduct approach at Cairo, Ill., to be built with PWA funds. Fabricated prices continue very ragged.

Tubular Goods

Mills in this district have entirely replenished their stocks of pipe, and operations are quite low. Standard pipe is quiet, but considerable tonnages are in prospect from PWA projects. The oil industry is doing little actual buying, but warehouse stocks are not excessive, and improved building operations will soon be reflected in steel demand. Boiler tubes are moving at a lower rate than was the case during December, and locomotive tubing is dull. However, railroad rehabilitation work now in prospect will bring considerable tonnage to mills during the first half of the year.

Wire Products

A moderate gain in the requirements of the automotive industry is reported in this district, but demand for merchant wire products continue very light. Distributers are well stocked and are not expected to buy heavily until warmer weather brings demand from the ultimate consumer.

Sheets

Demand is well sustained, but has not been sufficient to boost mill operations in this and nearby districts. Automotive parts makers are buying on a larger scale, but the automobile companies themselves are slow to make known their requirements. Mills

are urging the placing of tonnage as early as possible in the quarter, in order that shipments may be completed by March 31, as a price advance on the majority of sheet mill products is now considered almost certain. While some producers are predicting the filing of prices at least $5 a ton over current schedules, there is a divergence of opinion on the subject, and the changes may not be so drastic.

Tin Plate

Specifications continue very light, and mill operations vary widely throughout the district. Two large interests are running at about 50 per cent of capacity, but production at other plants ranges down to 25 per cent, with several units idle. The average for the industry is not above 35 per cent.

Strip Steel

Stronger demand from automotive parts makers is reported by practically all sellers, and in most cases material is wanted for very urgent shipment. As in the case of sheets, mills are anxious to place their regular customers under contract as early as possible in order to complete shipments by March 31. Unless this is done, it is quite possible that some users cannot be fully accommodated at current price levels in the last days of the quarter. Strip steel prices in the second three-month period of the year are not expected to be advanced sharply, although moderate increases are in prospect on both hot and cold-rolled grades.

Coal and Coke

The market is featured by a brisk demand for domestic coke, a large part of which is being furnished by by-product makers. Beehive oven producers have reduced their price on domestic fuel for a short period, but most distributers are covered with the by-product grade. Furnace coke is very quiet, and foundry requirements continue light. Coal prices under the code are unchanged, but are bringing in little business.

Scrap

The market in this district is temporarily easier, although long-range prospects remain bullish. Dealers have completed shipments against most of their recent orders, and such scrap as is now coming out is being offered at distress prices in order to move it. Dealers can pick up odd cars of No. 1 heavy melting steel as low as $12.50, and in some cases small lots have been offered mills at as low as $13. Nevertheless, the market is quotable at $13 to $13.50, with the likelihood that a large tonnage could not even be bought at the higher level. Hydraulic compressed sheets and hand-bundled sheets are lower in sympathy with steel, although machine shop turnings have been sold at prices above recent quoted levels. Cast scrap is also stronger, and specialties are difficult to obtain at currently quoted figures. Mills are showing no interest in additional purchases, but the prospects of an increased scrap melt within the next 60 days, and the recent sharp rise in prices, have made sellers of scrap reluctant to make heavy commitments at this time.

Tulsa Rolling Mill Goes to Sheffield

THE Tulsa Rolling Mills Co., operating a steel plant at Sand Springs, Okla., is to be rehabilitated and operated by the Sheffield Steel Corpn., Kansas City, Mo., subsidiary of the American Rolling Mill Co., Middletown, Ohio. A new corporation, designated as the Tulsa Steel Corpn., has been organized to operate the plant, with the Sheffield company furnishing the working capital as well as having charge of sales and plant operations. The deal was negotiated by Frank B. Foster and W. A. Royston, Jr., Pittsburgh industrial consultants.

R. L. Gray, president of the Sheffield company, will be vice-president of the new corporation, while L. W. Conroy will be in charge of plant operations. J. C. Shepherd, vice-president in charge of sales of the Sheffield company, and J. W. Anderson, general manager of sales, will hold similar positions in the Tulsa organization.

Gaylord and Grothaus Become MAPI Executives

ELECTION of Leo W. Grothaus, of Milwaukee, and Robert M. Gaylord, of Rockford, to its executive committee is announced by the Machinery and Allied Products Institute. The Institute, which has been the leader in the code deliberations of the capital goods industry of the country, is headed by John W. O'Leary, of Chicago.

Mr. Grothaus, an officer of the Allis-Chalmers Manufacturing Co., is the third prominent figure in Milwaukee industrial circles to be honored by the MAPI membership. The other two are Robert E. Friend, of the Nordberg Manufacturing Co. and C. S. Wagner, executive of the Koehring Co.

Mr. Gaylord, who is president of the Ingersoll Milling Machine Co., is former president of the National Machine Tool Builders Association. His election to the MAPI board gives Rockford two spokesmen. The other is A. M. Matteson, president of the Matteson Machinery Works.

Mr. Grothaus will represent the Rock and Ore Crusher Association in the MAPI councils.

Steel Output Rises At Buffalo

BUFFALO, Jan. 30.—An additional open-hearth unit has been added at Bethlehem's Lackawanna plant, raising the number of active furnaces to seven. Operations at other local steel plants are unchanged.

No awards appear to have been made in fabricated structural steel, but some developments are looked for in the near future in reinforcing bars.

Pig iron sales are slightly improved, and a few lots, larger than carload, have been placed. Foundries are operating slowly, though there are prospects of improvement in the next two months. All unshipped tonnage on order now will be canceled April 1. It appears probable that two more blast furnaces would join the active list in the near future. Republic Steel Corpn. and Bethlehem's Lackawanna plant will probably both blow in one unit.

Although a consumer recently purchased No. 1 and No. 2 heavy melting scrap at $10.50 and $9.50 respectively, dealers are quoting and paying prices that indicate a higher market level. As high as $9.65 is being offered by them to fill orders for No. 2 steel.

New Prices on Stainless Bars, Shapes, Plates

THE following new stainless steel prices were filed effective Jan. 20:

	Base Price per Lb., Pittsburgh
Carbon, 0.20 per cent maximum Nickel, 12 to 14 per cent Manganese, 5 to 7 per cent Chrome, 1 per cent maximum	
Bars	20c.
Plates	20c.
Sheets	25c.
Carbon, under 0.08 per cent Nickel, 8 per cent Chrome, 18 per cent Molybdenum, 2 to 4 per cent	
Rerolling billets	31c.
Carbon, 0.12 maximum Chrome, over 12 to 15 per cent Tungsten, 2½ to 3½ per cent	
Bars	24c.
Plates	27c.
Sheets	32c.
Carbon, 0.12 per cent maximum Chrome, over 15 to 18 per cent Tungsten, 2½ to 3½ per cent	
Bars	26½c.
Plates	29½c.
Sheets	36c.

The operating rate of the steel industry for the week beginning Jan. 29 was 34.4 per cent as compared with 32.5 per cent last week, according to the American Iron and Steel Institute.

Chicago Ingot Rate Rises One Point to 30½ Per Cent

Mills Book Considerable Automotive Tonnage—Rail Mills to Start on Light Schedule Soon—Higher Sheet and Semi-Finished Prices in Prospect

CHICAGO, Jan. 30. — Conditions are favorable for a slow but steady pick-up in ingot production, though it is becoming more apparent as each week passes that mill operations will remain unbalanced for some time to come. Several open-hearth furnaces have been lighted and output is up one point to 30½ per cent of capacity. Further gains should be recorded next week because of the rush of automobile companies for cold-rolled sheets, one producer of which is sold out for February and March. Rail mills may start rolling in the next week or 10 days but schedules will be far lighter than had been expected at this time. Bar mills are getting more orders, but structural business remains stationary with the outlook none too bright.

Prices remain steady, though there is continued talk of higher quotations on semi-finished steel and sheets. The scrap market remains basically strong and most dealers are firmly of the opinion that still higher prices will rule before the end of February.

Pig Iron

Final figures for the month will disclose that shipments of Northern foundry iron were only about one-half the movement in December. However, the effects of the year-end rush are wearing off and releases for February clearly indicate that shipments will gain in the near future. New buying for February and March is gathering momentum, though tonnages are not heavy. A Federal furnace is being prepared to produce pig iron. It should be in full blast soon after the middle of February.

Wire Products

Output remains at 35 per cent of capacity. Both new buying and fresh specifications are at the average rate of recent weeks and there is little that is tangible on which to base a forecast for the next few weeks. Optimism in the trade springs from the fact that automobile plants are expected to take heavy tonnages before the end of February and that sentiment in agricultural areas has improved because of the distribution of Government funds. Lack of moisture in some sections of the Middle West is causing some anxiety, though there is still time for the deficiency to be corrected. Jobbers' stocks are heavy, but they are moving faster than a year ago at this time. Producers have done little in the matter of stocking warehouses beyond efforts to round out supplies in lines that were considered too light for the expected spring demand.

Cast Iron Pipe

New orders are confined to a few scattered carlots. Inquiry is also inactive, the only large request for prices being for 3000 ft. of 16-in. pipe for Shorewood, Mich. Wilmette, Ill., may announce awards on 900 tons on Feb. 6. Bids have been thrown out by the six towns near Springfield, Ill., and these projects, calling for 6500 tons, will be readvertised. Chicago is still withholding contracts on 2400 tons of 12 and 16-in. pipe, bids on which were opened over a month ago.

Reinforcing Bars

Demand remains light, though prospects for orders are rather favorable. Illinois is opening bids on 1200 tons of road and bridge work; the Sanitary District, Chicago, is asking for bids on a second section of a sewer taking 700 tons. A new sewage plant at Peoria, Ill., will cost $1,000,000, and a school is to be constructed at Beloit, Wis. Preliminary engineering on the Outer Drive bridge, Chicago, is making satisfactory headway. Shop backlogs are dwindling and shipments are declining.

Cold-Rolled Strip

Demand is moderately better as a result of the growing need of automobile manufacturers who this week have buyers in Chicago negotiating for tonnages that will be required in the near future.

Rails and Track Supplies

Formal orders for rails and accessories have been issued by the Santa Fe and with the orders have come some releases. Both Chicago rail mills remain idle, but plans call for light rolling schedules beginning the latter part of next week.

Plates

Business continues to drag and mills see little ahead other than the promise of railroad car purchases. Bids on the Van Sweringen line cars have been opened and it is believed early action will be taken. Plate mills feel keenly the absence of brewery business and are getting little consolation in the way of tonnage from oil producing areas.

Structural Material

Fresh inquiries, bolstered by the revival of the Kansas City auditorium project, total close to 11,000 tons. Out of about 6000 tons of awards only 250 tons is for private work and less than one-tenth of the new inquiries reported represent private undertakings.

Bars

A moderate gain in the use of bar mill products is noted in this district. This is evident among miscellaneous users, automobile manufacturers and in spots among the agricultural machinery builders. The road machinery exhibition which closed last week was a marked improvement over the shows of the past two years and the Chicago Automobile Show is getting a flying start.

Coke

Prices for foundry coke are unchanged for the month of February. Shipments are slowly reaching higher levels.

Scrap

Additional sales of heavy melting steel at $11 a gross ton, delivered, definitely peg the market at this level. The Burlington Railroad has turned down the equivalent of $11.40 a gross ton, delivered, but on the other hand brokers find on trades that the market is easier by at least 25c. a ton. The predominating opinion is that the market has reached only a temporary halt, the lower prices among brokers being accounted for by the fact that mills have rigidly curtailed acceptances. However, it is well known that readily available supplies of No. 1 heavy melting steel are not large. On the other hand, there is much automobile scrap available. About 30,000 tons of scrap has been accumulated on Chicago docks.

Sets Record in Rolling Of Continuous Sheets

PRODUCTION of more than 100 tons of sheets an hour on the continuous mill of the Otis Steel Co., Cleveland, is believed to have set a world's record in the rolling of automobile body sheets. A total of 1784 tons was produced in 17½ hr. This surpasses by over 10 per cent the record rate of 91.7 tons an hour recently made by the Steubenville, Ohio, mill of the Wheeling Steel Corpn., and far surpasses the previous Otis record of 75 tons an hr. These records were made over the period scheduled for a day's run.

The Otis mill was built by the United Engineering & Foundry Co., Pittsburgh.

Valley Operations Recover as Sheet And Strip Demand Increases

YOUNGSTOWN, Jan. 30.—Sentiment in the Valley steel industry has reached a new high since the beginning of the depression during the last week. With both the Youngstown Sheet & Tube Co. and the Republic Steel Corpn. holding their annual sales meetings attended by sales personnel from the entire country, reports on 1934 expectations were uniformly encouraging.

In the meantime, orders for finished steel products have improved slightly. Although steel production declined last week, the loss is expected to be more than offset in the current period, and present activity is the result of actual orders rather than inventory replacement. Automotive buying is slowly expanding and miscellaneous orders are reported to be heavier for practically all products. Movement of sheets and strip steel in January has been at least 25 per cent ahead of December, and only in tin plate has there been a sharp contraction. Tin mills are still running on reduced schedules and little real improvement is expected before March.

Particular attention has been given recently to the prospects for pipe business. The addition of new capacity by a leading producer possibly provides the best answer for this survey. The oil industry seems certain to benefit materially from its code of fair competition and its requirements for tubular goods are expected to expand gradually during the year. The laying of additional line pipe is likely to be the last phase of the industry's rehabilitation. Demand for standard butt-weld pipe has been improving in a mild way for two or three months and has not yet felt the full benefits of PWA activity.

Local fabricators of steel products in the Valleys are also just now beginning to benefit from Federal building stimulation. Some companies have increased their production schedules sharply this month and are planning further advances. Their stocks of steel have thus far been ample for productive needs, but will soon be depleted.

Steel ingot production in the district this week will average 35 per cent of capacity, as against 30 per cent last week. An additional steel works blast furnace is being made ready for operation and will be blown in early in February. Finishing mill schedules are well sustained and are expanding in the case of strip and sheet units. Output of bars has failed to increase.

Recent efforts to clarify the more obscure points of the steel code have met with favorable reaction in this district. Nevertheless, large buyers of steel are still urging the establishing of Youngstown as a basing point on additional products. It is understood that this request is being given serious consideration by the directors of the American Iron and Steel Institute.

Demand for pig iron continues rather quiet. Ingot molds are in steady but light demand. Steel foundries are inactive, but are benefiting to some extent from PWA projects. The scrap market is quiet, but strong. Dealers are reluctant to name offering prices, as the recent sharp rise in quotations has forced them to make strenuous efforts to cover old commitments without a loss.

Canadian Steel Plants on 50 Per Cent Basis

TORONTO, ONT., Jan. 30.—Business improvement is spreading over various branches of Canadian industry, and steel mills are operating at 50 per cent of capacity, with sufficient orders on hand to maintain that rate for a couple of months, by which time it is expected further new business will develop.

Demand for pig iron is showing slow but steady improvement. Sales for the week totaled about 600 tons, with individual orders ranging from 50 to 200 tons. Pig iron production is holding at about 35,000 tons per month, with four stacks blowing. Prices are firm and unchanged.

Scrap also is improving in demand, with special grades receiving most attention. Inquiries are said to have been received by some dealers for steel scrap for export next spring, and it is understood that large orders from Britain are in prospect. Canadian mills are out of the market and the movement of heavy melting steel and turnings is negligible at this time. Iron grades are furnishing the bulk of new business. Prices are unchanged.

Structural Awards Heavier on Coast

SAN FRANCISCO, Jan. 29.—Bookings for the week were more numerous, with several calling for heavy tonnages of structural steel. The American Bridge Co. took approximately 2500 tons of structural steel for the Navy Yard causeway at Mare Island, Cal., and 364 tons for an undercrossing at Spokane, Wash. At Seattle, the Wallace Bridge & Structural Steel Co. was awarded 900 tons of structural for a viaduct. It was reported that 750 tons of structural steel for a hangar at the Navy Base at Coco Solo, C. Z., was placed with an Eastern mill. Structural steel awards totaled 6643 tons. Of the 2559 tons of reinforcing bars reported placed, 1004 tons went to the Pacific Coast Steel Corpn. and 945 tons to Soule Steel Co.

The market was marked by an absence of new projects. All bids on the bulkhead at Government Island, Cal., were rejected and new bids will be taken on revised specifications. This Coast Guard project will require 3300 tons of sheet piling. During the year the Metropolitan Water District will take bids at Los Angeles for 16,000 tons of reinforcing bars for use on the Colorado River aqueduct.

Marked Pick-up in Boston Pig Iron Sales

BOSTON, Jan. 30.—The past week witnessed a marked pick-up in sales of domestic pig iron, the aggregate being in excess of 3000 tons with the prospect of an additional 1000 tons late today. Sales included two 1000-ton lots of No. 1X iron. It is also understood that three textile machinery makers have bought sufficient Dutch iron to cover their entire 1934 requirements, the amount involved running into several thousand tons. Purchases of both domestic and imported irons were in anticipation of higher prices next quarter, rather than because of any decided improvement in the buyers' business.

Demand for scrap has tapered off somewhat, yet the aggregate movement for the week is fairly sizable. Buying centers very largely in steel turnings at $3 to $3.25 a ton on cars shipping point, forge flashings at $5 to $5.25, forge scrap at around $4.50, breakable cast at around $6.50, and stove plate at $4.50 to $4.75, all for Pennsylvania delivery, and No. 2 steel at $7 to $7.25 a ton, delivered Worcester, Mass. Some shafting was sold at $10 to $10.50 a ton f.o.b., but the supply is rather limited. Most owners of No. 1 heavy melting steel are holding for higher prices. One barge is loading No. 2 steel, etc., here for export via New York.

Boston closed bids last week on 2450 tons of 6 to 16-in. pipe. The Warren Foundry & Pipe Corpn. bid $40.45 a ton for the lot, and the United States Pipe & Foundry Co., $40.75 a ton.

Depot Quartermaster Marine Corps, Philadelphia, is asking bids until Feb. 5 for 10,150 mild steel bands, 37,975 lb. steel sheets, and 150 lb. of cold-rolled steel (Req. 964); until Feb. 9 for quantity of bronze ornaments for caps, hats, etc. (Schedule 286).

Steel Market Still Quiet at New York

Buying Fails to Pick Up Despite Insistent Reports of Pending Advances—Export Business Best in Months

NEW YORK, Jan. 30. — Steel bookings in January in this tertory were considerably smaller than those of December. As compared with January, 1933, specifications showed a good gain for some selling offices, while others did little better than equal the tonnage of a year ago. Export business in the past month was the best experienced in a considerable period. No particular commodity stood out in foreign sales, the orders having been spread out over miscellaneous products, including tin plate, sheets and wire products.

Reports of impending advances in sheets and strip steel are increasingly current, and there is now talk of possible advances on plates, shapes and bars. The prospect of higher prices, however, has not yet stimulated buying.

Railroad buying is still slow in materializing. The New York Central, which last week rejected bids on 10,000 to 11,000 tons of various finished products, will readvertise soon. The new tenders are being asked to permit mills to correct the errors they committed in computing mileage allowances.

Mills are now relying on PWA work to supply the tonnage business that they had expected to get from the carriers. There are now reasonable prospects, it is said, for considerable long-delayed public work to reach the contracting stage. Government financing has been arranged for a slum clearance project in the Bronx, requiring 3000 to 3500 tons of steel. This job, consisting of 103 apartment buildings, four to six stories in height, will be constructed by Starrett Brothers & Eken for the Hillside Development Corpn.

Pig Iron

Operating schedules of Metropolitan melters are slightly improved, but all founders in this district are concerned with the reduction of their large yard stocks and are limiting fresh purchases to carlots of analysis iron. Shipments on early January contracts are comparatively satisfactory. Bolstered by one 1400-ton sale, the week's bookings rose to 3200 tons, as compared with 1400 tons sold in each of the two preceding seven-day periods.

Reinforcing Steel

With the exception of a 150-ton bar award to Truscon Steel Co., this district was quiet during the past week. General contracts for highway work involving approximately 1500 tons of bars and mesh were announced in Albany, N. Y., on Friday, and local distributers expect this tonnage to be sublet within the next fortnight. No announcement has yet been made concerning the Tri-Borough Bridge approaches, and the Hudson River tunnel tonnage will not be in the market for at least two weeks.

Scrap

The market undertone in this district is somewhat uncertain as a result of the general buying disinterest recently displayed by important melters in eastern Pennsylvania. A steady flow of steel to export accounts, however, is preventing any open weakness of brokers' prices on active grades. Supplies are not particularly free, and one broker was obliged to pay $8.10, on barge, for No. 2 heavy melting steel in order to complete a steamer shipment. Representative market prices for No. 1 and No. 2 steel are, however, unchanged at respectively $9 and $7.50, barge, and $7.50 and $6 on cars. Cast grades are quotably unchanged but weak, as a reflection of lower bids offered by Bethlehem. Japan has temporarily withdrawn most inquiries from the market, but there is no reduction of tonnages being shipped to Poland and Italy. England and Spain are spiritedly inquiring for sizable tonnages, but, so far, they have not been disposed to meet domestic bids.

Automotive Orders Raise Rate in Southern Ohio

CINCINNATI, Jan. 30.—A sudden avalanche of orders from automotive sources has swelled finished sheet business to near capacity output. While definite figures on the extent of improved rolling schedules for this week are not obtainable, the leading interest indicates that all units will be operating near to 95 per cent of full capacity. Automobile manufacturers are insisting on early shipment of requirements, which will result in brisk activity in this district for at least two weeks. Sheet demand from other sources remains steady. Refrigerator manufacturers are taking material at what is considered a seasonally normal rate. Reports of an early price increase on sheets persist, with the possibility that revisions in schedules will be made before the end of the quarter. In some quarters it is believed that price changes will be made within the next two weeks, because quotations do not bear a fair relation to the rapid expansion of manufacturing costs.

Pig Iron

Improvement in demand for automotive castings, coupled with a small, but noticeable, recovery in machine tool business, has expanded the district melt to more encouraging proportions. Pig iron requirements, however, are being met, for the most part, from inventories that have been carried over from last year. New bookings have been light, totaling not more than 500 tons in single car lots. To take care of increased business, the Dayton Malleable Iron Co. opened its Ironton, Ohio, plant last week.

Coke

Two large industrial coke users have closed contracts for the year's requirements, making commitments for a total of about 115,000 tons. These are the first yearly contracts to be announced, other consumers being content to order for 30-day periods.

Scrap

Reported weakness in other districts has retarded even speculative buying in this district. Dealers are proceeding cautiously, although they have not seen fit to reduce present bid schedules. Yard supplies are fair, but interests are holding material for better prices.

Falk Licenses Christian Engineers

J. D. CHRISTIAN ENGINEERS, 514 Braunan Street, San Francisco, have been licensed by the Falk Corpn. of Milwaukee, to manufacture Rite-Lo-Speed motors under the original Christian design. The Falk Corpn. is the new owner of U. S. patent No. 1,860,703 originally issued to J. D. Christian. The standard motor units known as series HD manufactured by the Christian organization are produced under pending patent applications exclusively owned by J. D. Christian.

Further Gain in Output In Prospect at Cleveland

Demand from Automobile Industry Expands — 160,000 Tons of Steel for Van Sweringen Roads to Reach Mills Late Next Month—Scrap Higher

CLEVELAND, Jan. 30.—Ingot output is being mantained at 54 per cent of capacity in the Cleveland-Lorain district and the rate will be further increased later in the week by the addition of two open-hearth furnaces by the Corrigan, McKinney Steel Co. This company has added one furnace, now operating 10, but this increase was offset by the shutting down of one Otis furnace for repairs.

Steel plants are building up stocks of semi-finished steel in anticipation of heavy demand from finishing mills during the next few months after the automotive industry gets into full swing. Consequently recent local ingot output has been somewhat in excess of the consumer demand for finished steel.

Demand for sheets and strip from the automotive industry has continued to expand. Large tonnages were placed during the week by leading automobile builders, who are buying for shipment through March or as far as allowed by the steel code. New sizable orders came from the Fisher Body Corpn. for its Cleveland plant, which got under good operations this week. This business was distributed among Ohio mills. On Feb. 19, the Newton Steel Co. will place in operation its Newton Falls sheet mill, which has been idle for three years.

While January business in sheets and strip has been fair, new demand for bars, plates and shapes has been the lightest for several months, this being due to the forcing out of large tonnages in December by the first quarter price advance.

Interest locally is centered in the pending awards of 12,775 freight cars for the Erie, Chesapeake & Ohio and Nickel Plate railroads, which will take 160,000 to 175,000 tons of steel. Orders for these are expected to be placed with the car builders within a day or two and mills expect to be able to start rolling this steel in the latter part of February.

Talk of price advances on sheets and strip continues and is causing some consumers to protect themselves with contracts. Scrap prices have again advanced.

Pig Iron

Shipping orders have improved considerably during the last few days. They were light the greater part of the month, as many consumers acquired fairly large tonnage late in December which they took in against expiring contracts. Most of the new specifications are coming from automotive foundries. New business and inquiry have declined. A leading interest sold 3000 tons during the week, or only half as much tonnage as it sold the previous week.

Sheets

New orders in substantial tonnages came from the automotive industry during the week. These included a large purchase by the Fisher Body Corpn. for its Cleveland plant, which fabricates the steel for Chevrolet bodies. The local Cleveland plant, which has been on very limited operations because of delays in bringing out the new Chevrolet models, speeded up Monday to about 50 per cent of capacity, which rate will be increased as rapidly as possible until the plant is in full operation. Miscellaneous orders in this territory were rather light the past week. The possibility of a price advance is expected to bring out some tonnage shortly from the steel barrel industry.

Strip Steel

Some of the automobile parts makers are stepping up production and during the week issued additional specifications for hot and cold-rolled strip. New round-lot orders are expected from this source shortly, although some of the plants still have good stocks of certain sizes. Demand from local stamping plants doing automotive work has improved. Talk of price advances is causing some consumers to make contracts for the remainder of the quarter.

Bars, Plates and Shapes

The only sizable structural award is a bridge placed by the Erie Railroad, requiring 238 tons. Demand for merchant bars in small lots shows a moderate gain. Some fair tonnage has come from the forging industry. Bids for the first Ohio highway projects that will be carried out with the aid of NRA funds will be taken Feb. 9 and 10. These include a bridge requiring 150 tons of structural steel and various highway construction work calling for reinforcing bars. Plates are quiet.

Scrap

A Cleveland consumer a few days ago purchased around 5000 tons of steel-making and blast furnace scrap at reported prices of $11.25 to $11.50 for No. 1 heavy melting steel and $9 for borings and turnings. Dealers are paying $11 for the former and $8.50 for the latter to fill these orders. These prices established the local market at an advance of 50c a ton for heavy melting steel and 25c for blast furnace grades. The tone of the market continues firm. Scrap is moving in good volume to consumers, although one Valley district mill is holding up shipments this week.

Large Lock Job in St. Louis District

ST. LOUIS, Jan. 30.—James Stewart & Co., New York, are the low bidders on Lock No. 12 in the Mississippi River at Bellevue, Iowa, requiring 930 tons of structural steel, 500 tons of reinforcing bars, and 2200 tons of steel sheet piling. Purchasers of wire products and sheets are said to be out of the market until they have liquidated large stocks bought at fourth quarter prices.

The pig iron movement has been light the last two weeks. While melters say that their business is improving and stocks on hand are not large, they are awaiting further betterment before making additional commitments for material.

An East Side melter has bought a small lot of heavy melting steel, which was the most important transaction in a quiet week. Offerings of scrap are light, and dealers are reported to be disinclined to sell at present prices. Stocks in hands of mills are said to be not excessive, and with any further improvement in business will be consumed within the next 60 days. Selected heavy melting steel, steel rails less than 3 ft., No. 1 machinery cast and No. 1 railroad cast are 50c. a ton higher, and miscellaneous standard-section rails, cast-iron carwheels and railroad malleable are 25c. up.

Detroit Scrap Market Quiet

DETROIT, Jan. 30.—Little fresh buying has developed in the local scrap market the past week, but dealers reflect a bullish feeling about the possibility of purchases by steel mills in the next 30 days. Prices have not changed, although they temporarily show a weakening tendency.

Large Railroad Inquiry In Philadelphia Market

Pennsylvania to Close Feb. 5 on Large Requirements for Cars—Ingot Rate Down —Dollar Devaluation Stimulates Covering

PHILADELPHIA, Jan. 30.—The chief interest in the steel market in this district is in bids to be opened Feb. 5, for 22,350 tons of plates, shapes, bars and sheets representing partial requirements for 6500 freight cars to be built by the Pennsylvania Railroad at its shops in Altoona, Pitcairn and Enola, Pa. The fact that this steel is to be purchased through a Public Works Administration loan by Edwin W. Bainbridge and Charles McCall as owners has given rise to a problem that is being studied by the Code Committee of the American Iron and Steel Institute. The question in doubt is whether the tonnage must be quoted on under resolution No. 34, covering specific jobs financed by the Government, or under resolution No. 29, covering railroad purchases. The general view is that the quotations will have to be made under the former resolution.

The tonnage on which bids are to be opened is as follows: Plates, 6200 tons; steel bars, 1400 tons; shapes, 7000 tons; hot-rolled No. 10 gage sheets, 3600 tons; center sills, 4150 tons. In addition, the inquiry calls for 18,000 wheels and 3000 axles, and 166,000 ft. of copper-bearing steel pipe. The pipe requirements consist of 90,000 ft. of 1¼-in., 50,000 ft. of ⅜-in., 24,000 ft. of ¾-in. and 2000 ft. of 1-in. The Pennsylvania also has opened bids for bolts, nuts and rivets for the cars, the rivet requirements running up to 2000 tons.

The market is quiet but the trade reflects optimism over prospects of an early upturn in demand.

There is confusion as to the effect of the devalued dollar, though satisfaction is felt that it ought to have a stabilizing effect. Because of the anticipated rise in prices some mills are suggesting that consumers send in specifications at once. There also have been cases reported of buying on account of the reduced value of the dollar but the tonnage involved is not large. The trade is uncertain as to how great the effect will be on prices, though the trend is distinctly upward.

Meanwhile open-hearth operations have declined two points to 23 per cent of capacity.

Pig Iron

Only a few small, scattered inquiries are before the trade. Most melters have stocked tonnage and are well supplied for present requirements. Some, however, are increasing their melt and have indicated they may have to come into the market again in the near future.

Plates, Shapes and Bars

Except for the inquiry for the Pennsylvania's car building program the market is almost featureless. Some makers, however, report a moderate increase in miscellaneous plate orders. Fabricators report that some fair-sized projects are about to come out. Among them are about 2000 tons of bridges for which the Pennsylvania Highway Commission will open bids on Feb. 9. The McClintic-Marshall Corpn. has been awarded 1100 tons for buildings for the Celanese Corpn., Amcelle, Md.

Sheets

Fair-sized sheet tonnages have been taken by a local automotive body builder. Automotive sheet demand generally, however, is quiet, but with mechanical difficulties of car builders being overcome an early increase in demand appears to be in prospect. The largest pending sheet requirement is 3600 tons of No. 10 gage hot-rolled material for the Pennsylvania Railroad's car building program. It is expected that the tonnage will be distributed among several makers. There is a slight improvement in demand from stove makers and also for sheets for automobile radio sets. Radio manufacturers have laid out programs which will call for good-sized tonnages.

Warehouse Business

January business has been maintained on a parity with the level that prevailed in December. The past week saw a mild improvement in demand for miscellaneous requirements. Prices remain unchanged.

Imports

The following iron and steel imports were received here last week: 4825 tons of pig iron from the Netherlands and 91 tons of steel tubes and 34 tons of steel bars from Sweden.

Scrap

The market remains quiet but firm. Except in one instance mills are taking shipments against contracts and some are prepared to take additional tonnage in anticipation of increased operations. Certain brokers show a reluctance to sell at prevailing levels, believing that higher prices are an early prospect in view of the devalued dollar. Other dealers are entirely disregarding this factor and are readily taking business as it comes along. Strength has been given to the market by reason of growing demand for export. A boat will be loaded about the middle of February at Port Richmond, Philadelphia, with No. 2 heavy melting steel for shipment abroad. The price paid for this tonnage by the dealer was $9, f.a.s., Port Richmond.

Production In South Is Unchanged

BIRMINGHAM, Jan. 30.—Current buying of pig iron and steel is only fair, orders being irregular and mostly small. The heavy shipments of December have not been absorbed by consumers and present demand is limited thereby. Since the middle of the month there has been a slight upward tendency in both pig iron and steel. The curtailment in CWA buying of the past two weeks has been directly felt, since numerous small orders had been coming from that source.

Nine blast furnaces and 12 open-hearths have been active all month, and no change is in prospect for this week. The Ensley rail mill, previously scheduled to stop in January, is continuing at work. Prices are unchanged.

One Hundredth Voyage Of Carnegie Tow Service

VOYAGE No. 100 of the Carnegie river service began its 2000-mile trip down the Monongahela, Ohio and Mississippi rivers on Jan. 25. The tow was composed of 11 barges carrying approximately 8000 tons of rolled steel for delivery in the South and Southwest. The barges were towed by the I. Lamont Hughes, flagship of the Carnegie fleet. The sailing date, by coincidence, was also the natal day of the president of the Carnegie Steel Co., I. Lamont Hughes.

The Carnegie river service was inaugurated Dec. 18, 1922, and since that time has handled three-quarters of a million tons of rolled steel, the major portion of which was hauled to final destination by the railroads.

Spelter Advances 5 Points to 4.30c., Reflecting $1 Rise for Joplin Ore

Electrolytic Copper Uncertain at 8.25c., Connecticut—Lead Market Temporarily Quiet—Consumers Ignore Tin Market

NEW YORK, Jan. 30.—Late last week custom interests dropped their bids ⅛c. to 8.25c. a lb., delivered Connecticut valley, but the concession was generally ignored by consumers of electrolytic copper. Good tonnages are now available at 8.25c. for full first half delivery. Feb. 13 has been tentatively set as the date for public hearing on the code, but the market will probably remain somewhat unsettled until that time as buyers have no knowledge of the restriction which may be invoked. Unless a minimum price is established or some stock impounded, the present unfortunate accumulation of unwanted metal precludes any pronounced price buoyancy. American representatives disposed of good tonnages throughout the week in England and on the Continent at prices which ranged from 8.25c. to 8.36c. a lb., c.i.f. usual European base ports.

Total smelter and refinery stocks at the end of 1933 were 606,500 tons, representing a decrease of 84,500 tons or 12 per cent from the record stocks at the end of 1932. Production of new refined copper from domestic and foreign sources increased 11 per cent to 378,100 tons in 1933, and primary refineries produced about 15,000 tons more secondary metal in 1933 than in 1932. American industries accepted about 332,550 tons of new refined copper in 1933, a 28 per cent increase over 1932. Imports of manufactured copper decreased sharply in 1933, but exports showed little change.

The Week's Prices. Cents Per Pound for Early Delivery

	Jan. 24	Jan. 25	Jan. 26	Jan. 27	Jan. 29	Jan. 30
Electrolytic copper, N. Y.*	8.00	8.00	8.00	8.00	8.00	8.00
Lake copper, N. Y.	8.25	8.25	8.25	8.25	8.25	8.25
Straits tin, Spot, N. Y.	51.37½	51.10	50.87½	....	51.45	51.62½
Zinc, East St. Louis	4.25	4.25	4.25	4.25	4.30	4.30
Zinc, New York	4.60	4.60	4.60	4.60	4.65	4.65
Lead, St. Louis	3.90	3.90	3.90	3.90	3.90	3.90
Lead, New York	4.00	4.00	4.00	4.00	4.00	4.00

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, 98-99 per cent, 22.90c. a lb., delivered; new No. 12, 19.50c. a lb., delivered
Aluminum, remelt No. 12 (alloy), carload lots delivered, 13.50c. a lb., average for week.
Nickel electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 7.15c. a lb., New York.
Brass ingots, 85-5-5-5, 8.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits Pig	53.50c. to 54.50c.
Tin, bar	55.50c. to 56.50c.
Copper, Lake	9.75c. to 10.50c.
Copper, electrolytic	9.50c. to 10.00c.
Copper, castings	9.25c. to 10.25c.
*Copper sheets, hot-rolled	15.00c.
*High brass sheets	13.75c.
*Seamless brass tubes	16.25c.
*Seamless copper tubes	16.25c.
*Brass rods	12.25c.
Zinc, slabs	5.75c. to 6.75c.
Zinc sheets (No. 9), casks	9.75c. to 10.00c.
Lead, American pig	4.75c. to 5.75c.
Lead, bar	5.75c. to 6.75c.
Lead, sheets	7.75c.
Antimony, Asiatic	8.75c.
Alum., virgin, 99 per cent, plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	32.00c. to 33.00c.
Babbitt metal, commercial grade	25.00c. to 60.00c.

* These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	54.50c.
Tin, bar	56.50c.
Copper, Lake	9.00c.
Copper, electrolytic	9.00c.
Copper, castings	8.75c.
Zinc, slab	5.75c. to 6.00c.
Lead, American pig	5.00c. to 5.25c.
Lead, bar	8.00c.
Antimony, Asiatic	9.00c.
Babbitt metal, medium grade	19.50c.
Babbitt metal, high grade	60.00c.
Solder, ½ and ½	32.75c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	6.50c.	7.25c.
Copper, hvy. and wire	6.25c.	7.00c.
Copper, light and bottoms	5.25c.	6.25c.
Brass, heavy	3.50c.	4.25c.
Brass, light	3.00c.	3.625c.
Hvy. machine composition	4.75c.	5.625c.
No. 1 yel. brass turnings	4.25c.	5.125c.
No. 1 red brass or compos. turnings	4.25c.	5.25c.
Lead, heavy	3.00c.	3.625c.
Zinc	2.50c.	3.125c.
Cast aluminum	7.75c.	9.00c.
Sheet aluminum	11.50c.	12.75c.

Tin

Consumers are apparently indifferent to market offerings, and trading is almost entirely confined to occasional dealer transactions. Late today spot Straits at New York was available at 51.62½c. a lb., and London postings were £226 12s. 6d. for spot standard, and £229 15s. for Straits at Singapore. With the exception of close interest in the proposed "buffer pool," the English market is devoid of special features.

The revised statistics released by the Hague office indicate that 1933 world tin consumption approximated 127,000 tons, an increase of 27,000 tons compared with 1932. The 1933 total was, however, about 16,000 tons under the ten-year average ended with 1932. World statistical improvement in 1933 was mostly due to the greater American demands which aggregated 60,000 tons, an increase of 50 per cent compared with 1932.

Lead

Sales are now confined to routine carlots, but, as a result of the comfortable tonnages on most sellers' books, present prices are steady at 4c. a lb., New York, and 3.90c., St. Louis. January deliveries to consumers approximated 30,000 tons, February sales now total about 16,000 tons, and less than 3000 tons has been placed for March. A substantial quantity of February metal remains unsold, and these bookings are expected to gradually come into the market during the next fortnight unless trading is sharply stimulated by some unexpected development in Washington.

Zinc

New spelter bookings for the seven-day period totaled 2600 tons, as compared with 10,000 tons sold the preceding week. Full first quarter Prime Western is now difficult to secure under 4.30c. a lb., East St. Louis, although a few prompt lots are being transferred at 4.25c. The active buying of a fortnight ago established major sellers in a comparatively comfortable position, and they are consequently ignoring scattered efforts of buyers to shade quotations. This firm attitude in all directions is also encouraged by the recent $1 a ton advance in the ore market. Joplin concentrates are currently priced at $26 a ton, and that quotation is considered fairly firm as a result of the partially organized position of large Tri-State operators. Production was practically unchanged at 7000 tons, sales increased to 5400 tons, shipments fell 600 tons to 5400 tons, and visible stocks rose about 1500 tons to 18,550 tons. Because of this unfavorable stock balance, miners are again attempting to formulate production restrictions in order to obtain a higher return for ore.

Reinforcing Steel

Awards 2900 Tons—New Projects 2525 Tons

AWARDS

Hamilton, Ohio, 300 tons, sewer project, to Truscon Steel Co. and Benton Supply Co., Columbus, Ohio.

Chicago, 100 tons, Henrotin Hospital, to an unnamed bidder.

State of Utah, 120 tons, highway work in four counties, to unnamed bidders.

Boulder Dam, 150 tons, to Truscon Steel Co. and Soule Steel Co.

Denver, 355 tons, material for Owyhee project, to Pacific Coast Steel Corpn.

Seattle, 300 tons, State viaduct at Fourth Avenue South, to Pacific Coast Steel Corpn.

Pierce County, Wash., 130 tons, State crossing, to an unnamed bidder.

Los Angeles, 105 tons, State paving, to Pacific Coast Steel Corpn.

Camarillo, Cal., 700 tons, State hospital, to Soule Steel Co.

Riverside, Cal., 170 tons, Woodside Home addition, to Soule Steel Co.

Los Angeles County, Cal., 100 tons, Arroyo Seco channel, to Pacific Coast Steel Corpn. and Trojan Steel Co.

Los Angeles County, 150 tons, El Sereno Valley storm drain, to Pacific Coast Steel Corpn.

State of California, 185 tons, highway work in four counties, to unnamed bidders.

NEW REINFORCING BAR PROJECTS

Auburn, Mass., 120 tons, State road.

State of Illinois, 700 tons, highway bridge.

State of Illinois, 500 tons, road work; bids opened Jan. 26.

Peoria, Ill., tonnage being estimated, sewage plant to cost $1,000,000.

Beloit, Wis., tonnage being estimated, school.

Chicago, 700 tons, second section of sewer for Sanitary District.

Bellevue, Iowa, 500 tons, Lock No. 12 in Mississippi River; James Stewart & Co., low bidders.

Cast Iron Pipe

Boston has taken bids on 2450 tons of 6 to 16-in.; Warren Foundry & Pipe Corpn. is low bidder.

Boston has awarded 175 tons of branches, curves, etc., to Franklin Foundry Co., Inc.

St. Johnsboro, Vt., has awarded around 1600 tons of 6 to 20-in. pipe and 32 tons of special castings to United States Pipe & Foundry Co.

Attleboro, Mass., has awarded 110 tons of 6 and 8-in. to Warren Foundry & Pipe Corpn.

Norwalk, Conn., has closed bids on 6290 ft. of 16-in.; United States Pipe & Foundry Co. is the low bidder.

Waltham, Mass., has been granted $108,000 Government loan for a new water system.

Providence, R. I., has awarded 6000 tons to United States Pipe & Foundry Co.

Freeport, N. Y., plans pipe line for water supply and distribution. Government fund of $200,000 is being arranged. H. M. Wood is village engineer.

Virden, Ill., plans early call for bids for pipe for force main and water distribution. Fund of $188,000 has been secured through Federal aid, including pumping plant, elevated steel tank and tower and auxiliary waterworks equipment. Caldwell Engineering Co., Jacksonville, Ill., is engineer.

Bridgeport, Tex., plans pipe line for water system. Government fund of $145,000 has been arranged for this and waterworks station.

Cedar Rapids, Iowa, plans four new main water feeder pipe lines and about three miles of distribution lines. Special election will be called March 27 to vote bonds for $140,000 for work. F. E. Young is city engineer.

Shorewood, Mich., will buy 3000 ft. of 16-in.

Wilmette, Ill., has opened bids on 900 tons of 24-in. on which committee will report Feb. 6.

Cotter, Ark., plans water pipe line system. Fund of $55,000 has been arranged through Federal aid for this and waterworks station. R. E. Williams, Southern Building, Little Rock, Ark., is engineer.

Rising City, Neb., plans about 16,400 ft. for municipal water system. Financing has been arranged. Henningson Engineering Co., Union State Bank Building, Omaha, Neb., is consulting engineer.

Glenwood Springs, Colo., plans 6200 ft., 16, 20 and 24-in. for main water line. Fund of $22,000 has been arranged.

Marion, Ind., plans extensions in water pipe line system. Government fund of $221,000 is being arranged. Consoer, Older & Quinlan, 205 West Wacker Drive, Chicago, are consulting engineers.

Fresno, Cal., has taken bids on 380 tons of 8 to 12-in.

Mexico City, Mexico, has awarded 25,000 tons of 48-in. to Japanese interests.

Hialeah, Miami, Fla., has placed 6000 tons with United States Pipe & Foundry Co.

San Juan, Porto Rico, closed bids Jan. 30 on 8400 tons of 4 to 14-in. water pipe.

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Manufacturers of
COLD DRAWN STEELS
Turned and Polished Shafting, Turned and Ground Shafting

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES

Iron and Steel Bars

	Soft Steel	*Base per Lb.*
F.o.b. Pittsburgh mill		1.75c
F.o.b. Chicago or Gary		1.80c.
Del'd Philadelphia		2.04c.
Del'd New York		2.08c.
F.o.b. Cleveland		1.80c.
F.o.b. Buffalo		1.85c.
F.o.b. Birmingham		1.90c.
F.o.b. cars dock Pacific ports		2.30c.
F.o.b. cars dock Gulf ports		2.15c.

Rail Steel
(For merchant trade)

F.o.b. Cleveland	1.70c.
F.o.b. Chicago	1.70c.
F.o.b. Gary	1.70c.
F.o.b. Pittsburgh	1.65c.
F.o.b. Buffalo	1.75c.
F.o.b. Birmingham	1.80c

Billet Steel Reinforcing
(Cut lengths as quoted by distributers)

F.o.b. P'gh mills	1.90c.
F.o.b. Birmingham	1.95c.
F.o.b. Buffalo	1.95c.
F.o.b. Cleveland	1.95c.
F.o.b. Youngstown	1.95c.
F.o.b. cars dock Pacific ports	2.45c.
F.o.b. cars dock Gulf ports	2.30c.
F.o.b. Chicago	1.95c.

Rail Steel Reinforcing
(Cut lengths as quoted by distributers)

F.o.b. Pittsburgh	1.75c.
F.o.b. Cleveland	1.80c.
F.o.b. Chicago	1.80c.

Iron

Common iron, f.o.b. Terre Haute, Ind.	1.60c. to 1.75c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	1.89c.
Common iron del'd New York	1.93c.

Steel Car Axles

F.o.b. Pittsburgh	2.50c.
F.o.b. Chicago	2.50c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Gary	1.75c.
F.o.b. Birmingham	1.85c.
Del'd Cleveland	1.885c.
Del'd Philadelphia	1.885c.
F.o.b. Coatesville	1.80c.
F.o.b. Sparrows Point	1.80c.
Del'd New York	1.98c.
F.o.b. dock cars Pacific ports	2.25c
F.o.b. cars dock, Gulf ports	2.10c.
Wrought iron plates, f.o.b. P'gh	3.00c.

Floor Plates

F.o.b. Pittsburgh	3.20c.
F.o.b. Chicago	3.25c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Birmingham	1.85c.
F.o.b. Buffalo	1.80c.
F.o.b. Bethlehem	1.80c.
Del'd Cleveland	1.885c.
Del'd Philadelphia	1.905c.
Del'd New York	1.9525c.
F.o.b. cars dock, Gulf ports	2.10c.
F.o.b. dock cars Pacific ports (standard)	2.25c.
F.o.b. dock cars Pacific ports (wide flange)	2.35c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	2.00c.
F.o.b. Chicago mill	2.10c.
F.o.b. Buffalo	2.10c.
F.o.b. cars dock Gulf ports	2.45c.
F.o.b. cars dock Pacific ports	2.45c.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton. Open-hearth grade, base 2.45c. a lb. except at Bethlehem where the price is 2.55c.

S.A.E. Series Numbers	Alloy Differential per 100 lb.
2000 (½% Nickel)	$0.25
2100 (2½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.20
4100 Chromium Vanadium Spring Steel	0.95
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars is ½c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Cold Finished Bars*

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.15c.
Bars, Cleveland	2.15c.
Bars, Buffalo	2.20c.
Bars, Detroit	2.30c.
Bars, eastern Michigan	2.35c.
Shafting, ground, f.o.b. mill,	
1⅛ in.	3.40c.
1-3/16 to 1½ in.	2.90c.
1-9/16 to 1⅞ in.	2.75c.
1-15/16 to 2⅞ in.	2.60c.
2-15/16 to 6 in.	2.45c.

* In quantities of 10,000 to 19,000 lb.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot Rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.75c.
No. 10, f.o.b. Gary	1.85c.
No. 10, del'd Phila.	2.04c.
No. 10, f.o.b. Birmingham	1.90c.
No. 10, f.o.b. dock cars Pacific ports	2.42½c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.25c.
No. 24, f.o.b. Gary	2.35c.
No. 24, del'd Phila.	2.54c.
No. 24, f.o.b. Birmingham	2.40c.
No. 24, f.o.b. dock cars Pacific ports	2.95c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.30c.
No. 10 gage, f.o.b. Gary	2.40c.
No. 10 gage, del'd Phila.	2.59c.
No. 10 gage, f.o.b. dock cars Pacific ports	3.00c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.75c.
No. 20 gage, f.o.b. Gary	2.85c.
No. 20 gage, del'd Phila.	3.04c.
No. 20 gage, f.o.b. dock cars Pacific ports	3.45c.

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Gary	2.95c.
No. 24, del'd Phila.	3.14c.
No. 24, f.o.b. Birmingham	3.00c.
No. 24, f.o.b. dock cars Pacific ports	3.55c.
No. 24 Wrought iron, Pittsburgh	4.95c.

Long Ternes

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh	3.25c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	2.90c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.65c.
No. 28, Gary	2.75c.

Tin Plate *Base per Box*

Standard cokes, f.o.b. P'gh district mill	$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.90

Terne Plate
(F.o.b. Pittsburgh)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

	Base per Lb.
All widths up to 24 in., P'gh	1.75c.
All widths up to 24 in., Chicago	1.85c.
Cooperage stock, Pittsburgh	1.85c.
Cooperage stock, Chicago	1.95c.

Cold-Rolled Strips

F.o.b. Pittsburgh	2.40c.
F.o.b. Cleveland	2.40c.
Del'd Chicago	2.68c.
F.o.b. Worcester	2.60c.

Fender Stock

No. 20, Pittsburgh or Cleveland	3.10c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade

	Per Lb.
Bright wire	2.20c.
Spring wire	3.20c.

To Jobbing Trade

Extras of 10c. a 100 lb. on joint carloads and 30c. on pooled cars and less-than-carload lots are applied on all merchant wire products. An allowance of $2 a ton is made to jobbers on straight, mixed or joint carloads; $3 a ton is allowed on less-than-carload shipments.

	Base per Keg
Standard wire nails	$2.35
Smooth coated nails	2.35
Galvanized nails:	
15 gage and coarser	4.35
16 gage and finer	4.85
	Base per 100 Lb.
Smooth annealed wire	$2.35
Smooth galvanized wire	2.70
Polished staples	3.05
Galvanized staples	3.30
Barbed wire, galvanized	2.85
Woven wire fence, base column	60.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	*Wrought Iron* Inches	Black	Galv.
⅛	51½	29½	⅛	+91½	+138
¼ to ⅜	57	38½	¼ & ⅜	+1½	+21½
½	62	50½	½	31½	15
¾	65½	55½	¾	36½	20½
1 to 3	67½	58½	1 & 1¼	39½	25½
			1½	43½	28
			2	41½	26

Lap Weld

2	63½	54½	2	37	22½
2½ to 3	66½	57½	2½ to 3½	38	25
3½ to 6	68½	59½	4 to 8	40	28½
7 and 8	67½	57½	9 to 12	38	24½
9 and 10	67	57			
11 and 12	66	56			

Butt Weld, extra strong, plain ends

⅛	48½	33½	⅛	+13	+45½
¼ to ⅜	54½	41½	¼ & ⅜	+2½	+34½
½	60	51	½	32½	17½
¾	64½	55½	¾	37½	22½
1 to 3	66½	58½	1 to 2	43½	29

Lap Weld, extra strong, plain ends

2	61½	53½	2	40	26
2½ to 3	65½	57½	2½ to 4	45½	33
3½ to 6	69	61	4½ to 6	45	32½
7 and 8	68	58	7 & 8	46	33
9 and 10	67	57	9 to 12	41½	30
11 and 12	66	56			

Discounts on steel and wrought iron pipe are net and not subject to any points or preferentials.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		*Charcoal Iron*	
2 in. and 2¼ in.	33	1½ in.—1¾ in.	44
2½ in.—2¾ in.	40	2 in.—2¼ in.	13
3 in.	44	2½ in.—2¾ in.	16
3¼ in.—3½ in.	47	3 in.	17
4 in.	49	3¼ in. to 3½ in.	18
4½ in. to 6 in.	42	4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap welded steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload 4 points under base and two fives. Charcoal iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five. Exception: On 1½ to 1¾-in. charcoal iron tubes no supplementary discounts are granted, and the discount for 10,000 lb. to a carload is 4 points under base and for less than 10,000 lb. 8 points under base.*

Standard Commercial Seamless Boiler Tubes

Cold-Drawn			
1 in.	68	3 in.	38
1¼ to 1½ in.	68	3¼ to 3½ in.	41
1¾ in.	68	4 in.	43
2 to 2¼ in.	27	4½, 5 and 6 in.	36
2½ to 2¾ in.	34		

Hot-Rolled

2 and 2¼ in.	33	3¼ to 3½ in.	47
2½ and 2¾ in.	40	4 in.	49
3 in.	44	4½, 5 and 6 in.	42

In the case of all sizes except 1-in. to 1¾-in. cold-drawn boiler tubes supplementary discounts of two 5 per cents are allowed on carload lots. On quantities up to 10,000 lb. the base discount is reduced 10 points and a supplementary discount of 5 per cent only is allowed. On quantities 10,000 lb. to 24,999 lb. the base discount is reduced 6 points and a supplementary discount of 5 per cent only is allowed. On 25,000 lb. to a carload the base discount is reduced 2 points and supplementary discounts of two 5 per cents are allowed.

On 1 to 1¾-in. cold-drawn boiler tubes, there are no supplementary discounts. On quantities up to 10,000 lb. the base discount is reduced 12 points; on 10,000 lb. to 24,999 lb., it is reduced 8 points; on 25,000 lb. to a carload it is reduced 2 points.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 40% base	50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, 60-lb. and heavier, per gross ton	$36.37½
Angle bars, per 100 lb.	2.55

F.o.b. Code Basing Points

Light rails (from billets) per gross ton	$32.00
Light rails (from rail steel) per gross ton	31.00
	Base per 100 Lb.
Spikes, 9/16 in. and larger	$2.40
Spikes, ½ in. and smaller	2.40
Spikes, boat and barge	2.40
Tie plates, steel	1.90
Track bolts, to steam railroads	3.55
Track bolts, to jobbers, all sizes (per 100 count)	70 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, P'gh.	70, 25 and 10
Stove bolts in packages, Ch'go.	70, 25 and 10
Stove bolts in packages, Cleveland,	70, 25 and 10
Stove bolts in bulk, P'gh.	83
Stove bolts in bulk, Chicago	83
Stove bolts in bulk, Cleveland	83
Tire bolts	60

Large Rivets
(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.75
F.o.b. Chicago and Birmingham	2.85

Small Rivets
(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago and Birm'g'm	70 and 10

Cap and Set Screws
(Freight allowed up to but not exceeding 65c. per 180 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screw, 1 in. dia. and smaller	75, 10 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller	75 and 10
Milled headless set screws, cut thread ¾ in. and smaller	75
Upset hex. head cap screw, U.S.S.S. or S.A.E. thread, 1 in. dia. and smaller	85
Upset set screws cut and oval point	75 and 10
Milled studs	65 and 5

STAINLESS STEEL

(18% Cr. 8% Ni. 0.08 to 0.12% C)
(Base Prices, f.o.b. Pittsburgh)

	Per Lb.
Bars	23c.
Plates	26c.
Sheets	33c.
Hot-rolled strip	20c.
Cold-rolled strip	27c.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Youngstown, Chicago, Gary, Buffalo, Cleveland, Birmingham.

	Per Gross Ton
Rerolling	$26.00
Forging quality	31.00

Sheet Bars

F.o.b. Pittsburgh, Youngstown, Cleveland, Chicago, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open-hearth or Bessemer	$26.00

Skelp

F.o.b. Pittsburgh, Youngstown, Chicago, Buffalo, Coatesville, Pa., or Sparrows Point, Md.

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Pig Iron, Ores, Ferroalloys

Wire Rods
(Common soft, base)

	Per Gross Ton
Pittsburgh	$36.00
Cleveland	36.00
Chicago	37.00
Birmingham	39.00
Youngstown (del'd)	37.00

ALLOY STEEL BLOOMS, BILLETS AND SLABS

F.o.b. Pittsburgh, Chicago, Buffalo, Massillon, Canton or Bethlehem.

Base price, $49 a gross ton except at Bethlehem, where it is $51.

CARBON STEEL FORGING INGOTS

F.o.b. Pittsburgh, Youngstown or Chicago.

Uncropped, $28 per gross ton.

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville Prompt	$3.50
Foundry, f.o.b. Connellsville Prompt	$4.25 to 5.25
Foundry, by-product, Chicago ovens, for delivery outside switching district	8.50
Foundry, by-product, delivered in Chicago switching district	9.25
Foundry, by-product, New England, delivered	10.50
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland delivered	9.27
Foundry, Birmingham	4.75
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.55 to $1.80
Mine run coking coal f.o.b. W. Pa.	1.80 to 2.00
Gas coal, ¾-in. f.o.b. Pa. mines	2.00 to 2.30
Mine run gas coal, f.o.b. Pa. mines	1.80 to 2.20
Steam slack, f.o.b. W. Pa. mines	1.30 to 1.40
Gas slack, f.o.b. W. Pa. mines	1.65 to 1.85

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal f.o.b. Baltimore	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. del'd Chicago	
No. 3 industrial fuel oil	3.73c.
No. 5 industrial fuel oil	3.00c.
Per Gal f.o.b. Cleveland	
No. 3 distillate	5.75c.
No. 4 industrial	5.50c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works: High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$45.00	$40.00
Maryland	45.00	40.00
New Jersey	55.00	43.00
Ohio	45.00	40.00
Kentucky	45.00	40.00
Missouri	45.00	40.00
Illinois	45.00	40.00
Ground fire clay, per ton	7.00	

Chrome Brick

	Per Net Ton
Standard size	$45.00

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$45.00
Chicago	54.00
Birmingham	55.00
Silica clay, per ton	8.00

Magnesite Brick

	Per Net Ton
Standard sizes, burned, f.o.b. Baltimore and Chester, Pa.	$65.00
Unburned, f.o.b. Baltimore	55.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.06
Domestic, f.o.b. Chewelah, Wash.	22.00

CAST IRON PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$44.00 to $45.00
4-in., del'd Chicago	47.00 to 48.00
6-in. and larger, del'd New York	43.00
4-in., del'd New York	46.00
6-in., and larger, Birmingham,	36.00 to 37.00
4-in. Birmingham	39.00 to 40.00

Class "A" and gas pipe, $3 extra.

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	$18.50	$19.00	$18.00	$19.50
Bethelehem, Pa.	18.50	19.00	18.00	19.50
Birdsboro, Pa.	18.50	19.00	18.00	19.50
Swedeland, Pa.	18.50	19.00	18.00	19.50
Sparrows Point, Md.	18.50	....	18.00	....
Neville Island, Pa.	18.00	18.00	17.50	18.50
Sharpsville, Pa.	17.50	17.50	17.00	18.00
Youngstown	17.50	17.50	17.00	18.00
Buffalo	17.50	18.00	16.50	18.50
Erie, Pa.	17.50	18.00	17.00	18.50
Cleveland	17.50	17.50	17.00	18.00
Toledo, Ohio	17.50	17.50	17.00	18.00
Detroit	17.50	17.50	17.00	18.00
Hamilton, Ohio	17.50	17.50	17.00	18.00
Chicago	17.50	17.50	17.00	18.00
Granite City, Ill.	17.50	18.00	17.00	....
Duluth, Minn.	18.00	18.00	....	18.50
Birmingham	13.50	....	12.50	....
Provo, Utah	16.50	....	....	....

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District				
From Everett, Mass	$19.00	$19.50	$18.50	$20.00
From Buffalo	19.00	19.50	18.50	20.00
Brooklyn				
From East. Pa. or Buffalo	20.77	21.27	20.27	21.77
Newark or Jersey City, N. J.				
From East. Pa. or Buffalo	19.89	20.39	19.39	20.89
Philadelphia				
From Eastern Pa.	19.26	19.76	18.76	20.26
Cincinnati				
From Hamilton, Ohio	18.51	18.51	18.01	19.01
Canton, Ohio				
From Cleveland and Youngstown	18.76	18.76	....	....
Columbus, Ohio				
From Hamilton, Ohio	19.50	19.50	....	....
Mansfield, Ohio				
From Cleveland and Toledo	19.26	19.26	....	....
Indianapolis				
From Hamilton, Ohio	19.77	19.77	....	....
South Bend, Ind.				
From Chicago	19.55	19.55	....	....
Milwaukee				
From Chicago	18.50	18.50	....	....
St. Paul				
From Duluth	19.44	....	....	....
Davenport, Iowa				
From Chicago	19.26	19.26	....	....
Kansas City				
From Granite City	20.04	20.54	....	....

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N.Y. $23.00
Johnson City, Tenn. 23.00
Del'd Chicago 28.65

GRAY FORGE PIG IRON

Valley furnace $17.50

CHARCOAL PIG IRON

Lake Superior furnace $20.50
Delivered Chicago 23.54
Delivered Buffalo 23.78

CANADA

Pig Iron

Per gross ton:

	Delivered Toronto
No. 1 fdy., sil. 2.25 to 2.75	$21.00
No. 2 fdy., sil. 1.75 to 2.75	20.50
Malleable	21.00
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$22.50
No. 2 fdy., sil. 1.75 to 2.25	22.00
Malleable	22.50
Basic	22.00

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard, (carload)	$85.00
Domestic, 80%, seaboard, (ton lots)	92.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$27.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carloads)	$77.50
50% (ton lots)	85.00
75% (carloads)	126.00
75% (ton lots)	136.00
14% to 16% (f.o.b.) Welland, Ont. (in carloads) (duty paid)	31.00
14% to 16% (less carloads)	38.50

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$22.25	12%	$29.25
7%	23.25	13%	30.75
8%	24.25	14%	32.25
9%	25.25	15%	33.75
10%	26.25	16%	35.25
11%	27.75	17%	36.75

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$27.25	14%	$33.25
11%	28.75	15%	34.75
12%	30.25	16%	36.25
13%	31.75	17%	37.75

Manganese 1½ to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Other Ferroalloys

Ferrotungsten, per lb. contained W. del., carloads	$1.25 to $1.25
Ferrotungsten, less carloads	1.30 to 1.35
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	10.00c.
Ferrochromium, 2% carbon	16.50c. to 17.00c.
Ferrochromium, 1% carbon	17.50c. to 18.00c.
Ferrochromium, 0.10% carbon	19.50c. to 20.00c.
Ferrochromium, 0.06% carbon	20.00c. to 20.50c.
Ferrovanadium, del., per lb. contained V	$2.76 to $2.90
Ferrocarbontitanium, 15 to 18% Ti, 6 to 8% C, f.o.b. furnace, carload and contract per net ton	$137.50
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with $2 unitage	50.00
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton with $2.75 unitage	65.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Silico spiegel, per ton, f.o.b. furnace, car lots	$38.00
Ton lots or less, per ton	45.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	90.00
2% carbon grade	95.00
1% carbon grade	105.00
Spot prices	$5 a ton higher

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range, Bessemer, 51.5% iron	$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi, non-Bessemer, 51.50% iron	4.50
High phosphorous, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	9.50c.
Iron, low phos., Swedish, average 68½% iron	9.50c.
Iron, basic or foundry, Swedish, average, 65% iron	9c.
Iron, basic or foundry, Russian, aver. 65% iron	9c.
Manganese, Caucasian, washed 52%	22c.
Manganese, African, Indian, 44-48%	21c.
Manganese, African, Indian, 49-51%	24c.
Manganese, Brazilian, 46 to 48½	20c.

	Per Net Ton Unit
Tungsten, Chinese wolframite, duty paid delivered*	$15.00
Tungsten, domestic scheelite delivered	$14.50 to $15.00

	Per Gross Ton
Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic Seaboard	$17.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic Seaboard	20.00

*Quotations nominal in absence of sales.

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5 f.o.b. Kentucky and Illinois mines	$15.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	16.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	18.50
Domestic, No. 1 ground bulk, 85 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	30.00

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$13.00 to $13.50
No. 2 heavy melting steel	11.50 to 12.00
No. 2 railroad wrought	13.50 to 14.00
Scrap rails	13.50 to 14.00
Rails 3 ft. and under	14.50 to 15.00
Sheet bar crops, ordinary	14.00 to 14.50
Compressed sheet steel	13.25 to 13.75
Hand bundled sheet steel	11.50 to 12.00
Hvy. steel axle turnings	10.50 to 11.00
Machine shop turnings	9.50 to 10.00
Short shov. steel turnings	9.50 to 10.00
Short mixed borings and turnings	7.50 to 8.00
Cast iron borings	7.50 to 8.00
Cast iron carwheels	12.00 to 12.50
Heavy breakable cast	11.50 to 12.00
No. 1 cast	12.00 to 12.50
Railr. knuckles and couplers	15.00 to 15.50
Rail, coil and leaf springs	15.00 to 15.50
Rolled steel wheels	15.00 to 15.50
Low phos. billet crops	16.00 to 16.50
Low phos. sheet bar crops	15.50 to 16.00
Low phos. plate scrap	14.50 to 15.00
Low phos. punchings	15.00 to 15.50
Steel car axles	14.50 to 15.50

CHICAGO

Delivered Chicago district consumers:

	Per Gross Ton
Heavy melting steel	$10.50 to $11.00
Shoveling steel	10.50 to 11.00
Hydraulic comp. sheets	$9.25 to $9.75
Drop forge flashings	8.50 to 9.00
No. 1 busheling	9.25 to 9.75
Rolled carwheels	11.50 to 12.00
Railroad tires	11.50 to 12.00
Railroad leaf springs	11.00 to 11.50
Axle turnings	8.50 to 9.00
Steel couplers and knuckles	11.50 to 12.00
Coil springs	12.00 to 12.50
Axle turnings (elec. fur.)	9.25 to 9.75
Low phos. punchings	12.50 to 13.00
Low phos. plates, 12 in. and under	12.50 to 13.00
Cast iron borings	6.50 to 7.00
Short shoveling turnings	6.75 to 7.25
Machine shop turnings	6.50 to 7.00
Rerolling rails	11.50 to 12.00
Steel rails, less than 3 ft.	12.00 to 12.50
Steel rails, less than 2 ft.	12.50 to 13.00
Angle bars, steel	11.50 to 12.00
Cast iron carwheels	11.00 to 11.50
Railroad malleable	11.50 to 12.00
Agricultural malleable	9.00 to 9.50

Per Net Ton

Iron car axles	$12.00 to $12.50
Steel car axles	12.00 to 12.50
No. 1 railroad wrought	9.25 to 9.75
No. 2 railroad wrought	9.25 to 9.75

No. 2 busheling	$4.00 to	$4.50
Locomotive tires, smooth	9.00 to	9.50
Pipe and flues	5.25 to	5.75
No. 1 machinery cast	9.50 to	10.00
Clean automobile cast	9.00 to	9.50
No. 1 railroad cast	9.00 to	9.50
No. 1 agricultural cast	8.00 to	8.50
Stove plate	7.50 to	8.00
Grate bars	6.50 to	7.00
Brake shoes	8.50 to	9.00

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$11.50 to	$12.00
No. 2 heavy melting steel	....	9.50
No. 1 railroad wrought	....	11.00
Bundled sheets	....	9.50
Hydraulic compressed, new	9.50 to	10.00
Hydraulic compressed, old	7.00 to	7.50
Machine shop turnings	....	7.50
Heavy axle turnings	10.00 to	10.50
Cast borings	5.50 to	6.00
Heavy breakable cast	11.50 to	12.00
Stove plate (steel works)	....	9.50
No. 1 low phos. heavy	14.50 to	15.00
Couplers and knuckles	14.00 to	14.50
Rolled steel wheels	14.00 to	14.50
No. 1 blast furnace	5.50 to	6.00
Spec. iron and steel pipe	10.00 to	10.50
Shafting	....	16.50
Steel axles	....	14.50
No. 1 forge fire	11.00 to	11.50
Cast iron car wheels	12.50 to	13.00
No. 1 cast	12.00 to	13.00
Cast borings (chem.)	12.00 to	14.00
Steel rails for rolling	....	13.00

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$10.75 to	$11.50
No. 2 heavy melting steel	9.75 to	10.00
Compressed sheet steel	10.00 to	10.50
Light bundled sheet stampings	6.50 to	7.00
Drop forge flashings	9.25 to	9.75
Machine shop turnings	8.00 to	8.50
Short shoveling turnings	8.00 to	8.50
No. 1 busheling	9.50 to	10.00
Steel axle turnings	8.50 to	9.00
Low phos. billet crops	12.50 to	13.00
Cast iron borings	8.25 to	8.75
Mixed borings and short turnings	8.25 to	8.75
No. 2 busheling	8.25 to	8.75
No. 1 cast	10.50 to	11.00
Railroad grate bars	6.50 to	7.00
Stove plate	7.50 to	8.00
Rails under 3 ft.	14.00 to	14.50
Rails for rolling	14.00 to	14.50
Railroad malleable	11.75 to	12.00
Cast iron carwheels	....	11.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	....	$11.00
No. 2 heavy melting scrap	$9.50 to	10.00
Scrap rails	10.50 to	11.00
New hydraul. comp. sheets	9.50 to	10.00
Old hydraul. comp. sheets	6.50 to	7.00
Drop forge flashings	9.50 to	10.00
No. 1 busheling	9.50 to	10.00
Hvy. steel axle turnings	8.50 to	9.00
Machine shop turnings	7.00 to	7.50
Knuckles and couplers	12.00 to	12.50
Coil and leaf springs	12.00 to	12.50
Rolled steel wheels	12.00 to	12.50
Low phos. billet crops	13.50 to	14.00
Short shov. steel turnings	7.50 to	8.00
Short mixed borings and turnings	7.50 to	8.00
Cast iron borings	7.00 to	7.50
No. 2 busheling	6.50 to	7.00
Steel car axles	12.00 to	12.50
Iron axles	11.00 to	12.00
No. 1 machinery cast	12.00 to	12.50
No. 1 cupola cast	10.50 to	11.00
Stove plate	9.25 to	9.75
Steel rails, 3 ft. and under	12.00 to	12.50
Cast iron carwheels	11.00 to	11.50
Industrial malleable	11.50 to	12.00
Railroad malleable	11.50 to	12.00
Chemical borings	9.00 to	10.00

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	....	$10.00
Scrap steel rails	....	9.00
Short shoveling turnings	....	5.50
Stove plate	$7.00 to	7.50
Steel axles	11.00 to	11.50
Iron axles	11.00 to	11.50
No. 1 railroad wrought	....	7.00
Rails for rolling	....	10.50
No. 1 cast	9.00 to	9.50
Tramcar wheels	9.00 to	9.50
Cast iron borings, chem.	....	8.00

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	$10.50 to	$11.00
No. 1 heavy melting	9.00 to	9.50
No. 2 heavy melting	8.50 to	9.00
No. 1 locomotive tires	8.00 to	8.50
Misc. stand.-sec. rails	10.75 to	11.25
Railroad springs	11.50 to	12.00
Bundled sheets	6.00 to	6.50
No. 2 railroad wrought	9.00 to	9.50
No. 1 busheling	6.50 to	7.00
Cast iron borings and shoveling turnings	4.50 to	5.00
Rails for rolling	11.00 to	11.50
Machine shop turnings	4.25 to	4.75
Heavy turnings	5.50 to	6.00
Steel car axles	10.75 to	11.25
Iron car axles	12.50 to	13.00
Wrot iron bars and trans.	9.75 to	10.25
No. 1 railroad wrought	6.75 to	7.25
Steel rails less than 3 ft.	12.50 to	13.00
Steel angle bars	11.50 to	12.00
Cast iron carwheels	8.50 to	9.00
No. 1 machinery cast	9.00 to	9.50
Railroad malleable	9.00 to	9.50
No. 1 railroad cast	8.50 to	9.00
Stove plate	6.50 to	7.00
Relay rails, 60 lb. and under	16.00 to	16.50
Relay rails, 60 lb. and over	$20.00 to	$21.00
Agricult. malleable	9.00 to	9.50

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$6.75 to	$7.25
Scrap T rails	6.75 to	7.25
Machine shop turnings	3.00 to	3.25
Cast iron borings	4.00 to	4.25
Bundled skeleton, long	4.75 to	5.25
Forge flashings	5.00 to	5.50
Blast furnace scrap	2.75 to	3.00
Shafting	10.25 to	10.50
Steel car axles	9.75 to	10.25
Wrought pipe	4.50 to	4.75
Rails for rerolling*	14.00 to	14.50
Stove plate	4.50 to	4.75
Cast iron borings, chemical	9.00 to	9.50

Per gross ton delivered consumers' yards:

Textile cast	$10.00 to	$10.50
No. 1 machinery cast	10.00 to	10.50
Railroad malleable	11.00 to	11.50

*Delivered Eastern Pennsylvania points.

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$7.50 to	$9.00
No. 2 heavy melting steel	6.00 to	7.50
Heavy breakable cast	7.50 to	8.00
No. 1 machinery cast	8.00 to	8.50
No. 2 cast	6.50 to	7.00
Stove plate	5.00 to	5.50
Steel car axles	10.50 to	10.75
No. 1 railroad wrought	7.50 to	8.00
No. 1 yard wrought, long	$6.50 to	$7.00
Spec. iron and steel pipe	5.75 to	6.00
Forge fire	5.50 to	6.00
Rails for rerolling	8.00 to	8.50
Short shoveling turnings	3.00 to	3.50
Machine shop turnings	3.50 to	3.75
Cast borings	4.50 to	4.75
No. 1 blast furnace	2.50 to	3.00
Cast borings (chemical)	11.00 to	11.50
Unprepared yard iron and steel	4.50 to	5.00

Per gross ton, delivered local foundries:

No. 1 machinery cast	$11.00
No. 1 hvy. cast (cupola size)	10.00
No. 2 cast	9.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$8.25 to	$9.00
Scrap rails for melting	9.00 to	9.50
Loose sheet clippings	4.75 to	5.25
Bundled sheets	6.00 to	6.50
Cast iron borings	6.00 to	6.50
Machine shop turnings	5.50 to	6.00
No. 1 busheling	6.50 to	7.00
No. 2 busheling	3.50 to	4.00
Rails for rolling	9.50 to	10.00
No. 1 locomotive tires	9.00 to	9.50
Short rails	11.75 to	12.25
Cast iron carwheels	8.25 to	8.75
No. 1 machinery cast	9.50 to	10.00
No. 1 railroad cast	9.00 to	9.50
Burnt cast	6.50 to	7.00
Stove plate	6.50 to	7.00
Agricultural malleable	8.50 to	9.00
Railroad malleable	9.00 to	9.50

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	$8.50 to	$9.00
Borings and short turnings	6.50 to	7.00
Long turnings	5.50 to	6.00
No. 1 machinery cast	9.00 to	9.50
Automotive cast	10.25 to	10.75
Hydraul. comp. sheets	8.75 to	9.25
Stove plate	6.50 to	7.00
New factory busheling	7.50 to	8.00
Old No. 2 busheling	5.00 to	5.50
Sheet clippings	6.00 to	6.50
Flashings	7.25 to	7.75
Low phos. plate scrap	9.75 to	10.35

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$5.50	$5.50
Rails, scrap	6.00	4.50
Machine shop turnings	2.50	2.50
Boiler plate	4.50	4.50
Heavy axle turnings	2.50	2.50
Cast borings	3.00	3.00
Steel borings	2.00	2.00
Wrought pipe	2.50	2.50
Steel axles	4.50	6.00
Axles, wrought iron	4.50	8.50
No. 1 machinery cast	7.75	9.00
Stove plate	4.50	5.00
Standard carwheels	7.25	7.00
Malleable	6.75	7.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	3.05c.
Structural shapes	3.05c.
Soft steel bars and small shapes	2.85c.
Reinforcing steel bars	3.00c.
Cold-finished and screw stock—	
Rounds and hexagons	3.20c.
Squares and flats	3.20c.
Hoops and bands, under ¼ in.	3.10c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.70c.
Hot-rolled sheets (No. 10)	2.85c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.32
Spikes, large	2.90c.
Small	2.65c.
Bolts	2.90c.
Track bolts, all sizes, per 100 count,	65 per cent off list.
Machine bolts, 100 count,	65 per cent off list.
Carriage bolts, 100 count,	65 per cent off list.
Nuts, all styles, 100 count,	65 per cent off list.
Large rivets, base per 100 lb.	$3.25
Wire, black, soft ann'l'd, base per 100 lb.	2.90
Wire, galv. soft, base per 100 lb.	3.35
Common wire nails, per keg	2.65
Cement-coated nails, per keg	2.65

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 9999 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	2.90c.
Cold-fin. steel bars and shafting	
Rounds and hexagons	3.40c.
Flats and squares	3.40c.
Bands, 3/16 in. (in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.20c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.30c.
Hot-rolled sheets (No. 10)	2.85c.
Spikes (9/16 in. and lighter)	3.50c.
Track bolts	4.65c.
Rivets, structural (keg lots)	3c.
Rivets, boiler (keg lots)	3.10c.

	Per Cent Off List
Machine bolts	60 and 5
Carriage bolts	60 and 5
Coach and lag screws	60 and 5
Hot-pressed nuts, sq., tap. or blank	60 and 5
Hot-pressed nuts, hex., tap. or blank	60 and 5
Hex. head and cap screws	80
Cup point set screws	70
Flat head bright wood screws	37½ and 10
Spring cotters	50
Stove bolts in full packages	72½
Rd. hd. tank rivets, 7/16 in. and smaller	65
Wrought washers	$5.50 off list
No. 8 black ann'l'd wire per 100 lb.	$3.75
Com. wire nails, base per keg	2.70c.
Cement c't'd nails, base per keg	2.70c.

NEW YORK

	Base per Lb.
Plates	3.30c.
Structural shapes	3.27c.
Soft steel bars, small shapes	3.17c.
Iron bars	3.24c.
Iron bars, swed. charcoal	6.50 to 7.00c.
Cold-fin. shafting and screw stock; Rounds and hexagons	3.92c.
Flats and squares	4.42c.
Cold-roll. strip, soft and quarter hard	4.00c.
Hoops	3.42c.
Bands	3.42c.
Hot-rolled sheets (No. 10)	3.17c.
Hot-rolled ann'l'd sheets (No. 24*)	3.65c.
Galvanized sheets (No. 24*)	4.25c.
Long terne sheets (No. 24)	4.75c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.30c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ⅛ in. and larger	3.75c.
Open hearth spring steel, bases	3.75c. to 10.00c.
Common wire nails, base, per keg	$3.00

	Per Cent Off List
Machine bolt, cut thread:	
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	60
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50

	Per 100 Ft.
Boiler tubes:	
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST LOUIS

	Base per Lb.
Plates and struc. shapes	3.34c.
Bars, soft steel or iron	3.14c.
Cold-fin. rounds, shafting, screw stock	3.74c.
Hot-rolled annealed sheets (No. 24)	3.94c.
Galv. sheets (No. 24)	4.54c.
Hot-rolled sheets (No. 10)	3.19c.
*Black corrug. sheets (No. 24)	3.99c.
Galv. corrug. sheets	4.59c.
Structural rivets	3.59c.
Boiler rivets	3.69c.

	Per Cent Off List
Tank rivets, 7/16 in. and smaller	60
Machine and carriage bolts, lag screws, fitting up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts	
1000 lb. or over	60
200 to 999 lb.	55 and 5
100 to 199 lb.	50 and 5
Less than 100 lb.	50

*No. 26 and lighter take special prices.

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	2.75c.
*Structural shapes	2.75c.
*Soft steel bars, small shapes, iron bars (except bands)	2.75c.
‡Reinforc. steel bars, sq. twisted and deformed	2.505c.
Cold-finished steel bars	3.73c.
*Steel hoops	3.30c.
*Steel bands, No. 12 to 3/16 in., incl.	3.05c.
Spring steel	5.00c.
†Hot-rolled annealed sheets (No. 24)	3.40c.
†Galvanized sheets (No. 24)	4.00c.
*Hot-rolled annealed sheets (No. 10)	2.95c.
Diam. pat. floor plates, ¼ in.	4.75c.
Swedish iron bars	6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 50 bundles or over.

‡For 5 tons or more, exclusive of cutting charge.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	3.21c.
Soft steel bars	2.90c.
Reinforc. steel bars	2.00c. to 2.50c.
Cold-finished steel bars	3.40c.
Flat rolled steel under ¼ in.	3.26c.
Cold-finished strip	5.55c.
Hot-rolled annealed sheets (No. 24)	3.76c.
Galvanized sheets (No. 24)	4.36c.
Hot-rolled sheets (No. 10)	3.01c.
Black ann'l'd wire, per 100 lb.	$2.45
No. 9 galv. wire, per 100 lb.	2.80
Com. wire nails, base per keg	2.45

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.30c.
Bars, soft steel or iron	3.10c.
New billet reinforc. bars	3.10c.
Rail steel reinforc. bars	3.10c.
Hoops and bands, 3/16 in. and lighter	3.35c.
Cold-finished bars	3.70c.
Hot-rolled annealed sheets (No. 24)	3.85c.
Galv. sheets (No. 24)	4.45c.
Hot-rolled sheets (No. 10)	3.10c.
Structural rivets	4.00c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.95
Chain, 1-in., per 100 lb.	8.35

	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	$17.69
4-in.	41.23
Lap-welded steel boiler tubes, 2-in.	16.42
4-in.	38.31

BUFFALO

	Base per Lb.
Plates	3.27c.
Struc. shapes	3.15c.
Soft steel bars	2.95c.
Reinforcing bars	1.95c.
Cold-fin. flats and sq.	3.35c.
Rounds and hex.	3.25c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	4.00c.
Galv. sheets (No. 24)	4.15c.
Bands	3.32c.
Hoops	3.32c.
Hot-rolled unannealed sheets	3.07c.
Com. wire nails, base per keg	$3.00
Black wire, base per 100 lb.	3.25

BOSTON

	Per Lb.
Beams, channels, angles, tees, zees	3.42c.
H beams and shapes	3.42c.
Plates—sheared, tank and univ. mill, ¼ in. thick and heavier	3.43c.
Floor plates, diamond pattern	5.18c.
Bar and bar shapes (mild steel)	3.25c.
Bands 3/16 in. thick and No. 12 ga. incl.	3.50c. to 4.50c.
Half rounds, half ovals, ovals and bevels	4.50c.
Tire steel	4.50c.
Cold-finished rounds and hexagons	3.70c.
Cold-rolled strip steel	5.20c.
Cold-finished squares and flats	4.20c.
Blue annealed sheets, No. 10 ga.	3.25c.
One pass cold-rolled sheets No. 24 ga.	3.50c.
Galvanized steel sheets, No. 24 ga.	4.60c.
Lead coated sheets, No. 24 ga.	5.65c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials.

PACIFIC COAST

	San Francisco	Los Angeles	Seattle
	Base per Lb.		
Plates, tank and U.M.	3.50c.	3.40c.	3.40c.
Shapes, standard	3.50c.	3.40c.	3.40c.
Wide-flanged beams and columns	3.70c.	3.60c.	3.60c.
Soft steel bars	3.55c.	3.40c.	3.40c.
Reinforcing bars	3.10c.	3.15c.	3.50c.
Hot-rolled annealed sheets (No. 24)	4.25c.	4.15c.	4.25c.
Hot-rolled sheets (No. 10)	3.75c.	3.65c.	3.65c.
Galv. sheets (No. 24)	4.85c.	4.75c.	4.85c.
Struc. rivets, ½ in. and larger	6.25c.	6.00c.	5.00c.
less than 100 lb.			
Cold finished steel			
Rounds	5.95c.	5.95c.	4.75c.
Squares and hexagons	7.20c.	7.20c.	6.00c.
Flats	7.70c.	7.70c.	7.00c.
Common wire nails —base per keg	$3.35	$3.25	$3.45
less carload			

All items subject to differentials for quantity.

FINANCIAL REPORTS

Continental Can Co., having experienced one of the best years in history in 1933, estimates earnings to have been equal to about $4 a share on outstanding common stock. Indicated net income at more than $6,900,000, compares with net income of $4,819,323 in 1932 and $5,670,099 in 1931.

* * *

Interlake Iron Corpn. reports net loss of approximately $800,000 after all charges for the 11 months ended Nov. 30 last, in comparison with a net loss of about $1,650,000 for the corresponding period of 1932. However, December results with year-end adjustments are expected to bring net loss for the full year to between $900,000 and $1,000,000. This would compare with a net loss for 1932 of $2,169,887 after all charges including $714,208 to cover adjustment of inventory value and investment and reserve for bad and doubtful accounts.

* * *

Mid-West Screw Products Co., St. Louis, reports year-end business for the period embracing the latter half of November, all of December and the first week in January, at an increase of nearly 30 per cent over the corresponding period a year ago. The branch of business showing the best results was reported to have been the automotive accessory manufacturing industry.

* * *

Liberty Foundry Co., manufacturers of gray iron castings and warm-air furnaces, St. Louis, reports tonnage produced during 1933 as 30 per cent greater than in the preceding year, due primarily to greater tonnage castings used by machinery manufacturers, electrical equipment manufacturers, stoves, furnaces and construction projects.

* * *

Key Boiler Equipment Co., St. Louis, reports preliminary estimates indicate that the company closed the year 1933 with a small profit after depreciation charges, in contrast to the loss of $119,124 at the close of 1932.

* * *

National Bearing Metals Corpn., St. Louis, declared the regular quarterly dividend of $1.75 and an additional $2 dividend on arrearage on the preferred stock, payable Feb. 1 to record Jan. 18. With this payment the company will have disbursed an aggregate of $9.25 a share on the preferred stock since resuming dividends last summer. The company is said to have ended the year with a profit, although actual figures have not as yet been disclosed. In 1932 the company's loss was $162,302.

* * *

L. R. Flori Pipe Co., St. Louis, reports the year 1933 ending with an operating profit of at least 25 per cent of its invested capital. Present orders on hand are said to be sufficient to carry the company through three months of operations.

National Steel Earns $1.30 a Share in 1933

The National Steel Corp., Pittsburgh, in the year ended Dec. 31, 1933, had net profit of $2,812,406 after Federal taxes, depreciation, depletion and interest, equivalent to $1.30 a share on 2,156,832 common shares. This compares with $1,662,919 or 77c. a share in 1932. At the close of the second quarter the stock was restored to an annual dividend basis of $1 per share, having been reduced in September, 1932, to 50c. basis. The regular dividend of 25c. per share was declared on Jan. 10, 1934.

For the fourth quarter net profit was $242,530 after taxes and charges, equal to 11c. a share, comparing with $354,045 or 16c. a share in the December quarter of previous year. This showing was made in spite of labor troubles in the Weirton Steel Co. plant during the last three months.

1933—2,048,000
1934—3,500,000!

Detroit is predicting three and a half million automobiles in 1934—a 75% increase over 1933. That means a corresponding increase in drop forge production, and the business is going to the shop that is ready for it.

The ability of your shop to absorb a sudden increase in production is seriously impaired by code restrictions on operating hours. Correct this situation by replacing obsolete equipment with modern Erie Drop Hammers.

Now is the time, too, to make repairs, replace worn or broken parts, so that reserve equipment can take the extra production, that cannot be met by overtime. Be prepared for emergencies; remember that with shorter work days it takes longer to get repair parts.

ERIE FOUNDRY COMPANY
ERIE, PENNA., U. S. A.

DETROIT: 335 CURTIS BUILDING
CHICAGO: 549 WASHINGTON BLVD.
INDIANAPOLIS: 335 POSTAL STATION BUILDING
PARIS, FRANCE: 8 RUE DE ROCROY

ERIE

Fabricated Structural Steel

Lettings Higher—New Projects in Better Volume

BOOKINGS of 18,800 tons were the second largest for any week this year and compare with 11,550 tons a week ago. The greatest activity was on the Pacific Coast, where 2500 tons was awarded for a causeway at the Mare Island Navy Yard. Other sizable lettings included 1450 tons for a subway approach to the Philadelphia-Camden Bridge and 1070 tons for a lock and dam in the Mississippi River at Bellevue, Iowa. New projects of 15,725 tons compare with 5450 tons in the previous week and 14,250 tons two weeks ago. Inquiries include 5000 tons for a bridge at Cambridge, Md., across the Chop Tank River and 3800 tons for a viaduct approach at Cairo, Ill., for the Illinois Central Railroad. Lettings in January totaled 60,890 tons compared with 79,925 tons in December and 80,275 tons in November. Structural steel awards for the week follow:

NORTH ATLANTIC STATES

Ellsworth, Me., 115 tons, municipal buildings, to Lyons Iron Works, Inc.

Fort Jay, N. Y., 140 tons, officers' apartment, to Belmont Iron Works.

Brooklyn, 510 tons, addition to **Daily News** building, to Post & McCord.

East Aurora, N. Y., 750 tons, Pennsylvania Railroad bridge, to Wisconsin Bridge Co.; previously reported awarded to another bidder.

Horsehead, N. Y., 240 tons, bridge for Erie Railroad, to McClintic-Marshall Corpn.

Harrison, N. J., 130 tons, Pennsylvania Railroad tower, to McClintic-Marshall Corpn.

Plainfield, N. J., 125 tons, industrial building, to Lehigh Structural Steel Co.

Montgomery County, Pa., 130 tons, beam bridge, to McClintic-Marshall Corpn.

Atlantic City, N. J., 150 tons, platform shelters for Pennsylvania Railroad, to American Bridge Co.

Philadelphia, 1540 tons, subway approach for Philadelphia-Camden bridge, to McClintic-Marshall Corpn.

Wilmington, Del., 100 tons, office building for Wilmington Water Commission, to McClintic-Marshall Corpn.

Baltimore, 180 tons, building for American Zirconium Corpn., to Maryland Steel Products Co.

Washington, 260 tons, Gallinger Hospital building, to Dietrich Brothers.

SOUTH AND SOUTHWEST

Norfolk, Va., 850 tons, highway bridge, to Virginia Bridge & Iron Co., Inc.

Covington, Ky., 395 tons, steam plant, to F. M. Weaver & Co., Inc.

Branford, Fla., 320 tons, State highway bridge, to Nashville Bridge Co.

Wilcox, Fla., 310 tons, State highway bridge, to Vincennes Bridge Co.

Pensacola, Fla., 330 tons, bridge, to Ingalls Iron Works.

Beaumont, Tex., 215 tons, Duo-Sol plant, to American Bridge Co.

Pecos County, Tex., 120 tons, highway bridge, to Petroleum Iron Works.

Nacogdoches County, Tex., 210 tons, highway bridge, to Virginia Bridge & Iron Co., Inc.

Lampasas County, Tex., 210 tons, highway bridge, to Houston Structural Steel Co.

State of Oklahoma, 625 tons, bridges, to Muskogee Iron Works, Pittsburgh-Des Moines Steel Co., and Illinois Steel Bridge Co.

CENTRAL STATES

Cincinnati, 410 tons, factory building for Andrew Jergen, to Pittsburgh Bridge & Iron Co.

Dayton, Ohio, 270 tons, State Highway bridge, to Fort Pitt Bridge Works Co.

Milwaukee, 100 tons, Milwaukee Road shop repair, to Wisconsin Bridge & Iron Co.

State of Illinois, 135 tons, three highway bridges, to Vincennes Bridge Co.

Alton, Ill., 5000 tons sheet piling, dam across Mississippi River, to an unnamed bidder.

Galesburg, Ill., 125 tons, school, to Davenport Machine & Foundry Co., Davenport, Iowa.

Bellevue, Iowa, 1070 tons, locks and dam, to McClintic-Marshall Corpn.

Monona County, Iowa, 125 tons, beam spans, to Omaha Steel Works.

Des Moines, Iowa, 800 tons, Euclid Avenue bridge, to Wisconsin Bridge & Iron Co.

Minot, N. D., 100 tons, store, to Fargo Foundry Co., Fargo.

State of Kansas, 450 tons, bridges, to Pittsburgh-Des Moines Steel Co.

Kansas City, Mo., 150 tons, store, to Kansas City Structural Steel Co.

Douglas County, Neb., 1070 tons, bridges to Omaha Steel Works.

WESTERN STATES

Aguilar, Colo., 100 tons, bridge, to E. Burkhardt & Sons Steel & Iron Works Co., Denver.

Granite County, Mont., 100 tons, State bridge, to an unnamed bidder.

Spokane, Wash., 365 tons, State undercrossing, to American Bridge Co.

Fort Lewis, Wash., 200 tons, six gun sheds, to Pacific Car & Foundry Co.

Fort Lewis, 350 tons, two barracks, to L. A. Young & Sons.

Wapato, Wash., 130 tons sheet piling, for Indian Irrigation Service, to Pacific Coast Steel Corpn.

Seattle, 900 tons, State viaduct at Fourth Avenue South, to Wallace Bridge & Structural Steel Co.

Mare Island, Cal., 2500 tons, causeway at Navy Yard, to American Bridge Co.

State of California, 145 tons, highway work in two counties, to unnamed bidders.

Douglas County, Ore., 375 tons, State bridge, to an unnamed bidder.

State of Oregon, 135 tons, highway work in three counties, to unnamed bidders.

Pomona, Cal., 100 tons, Montgomery Ward building, to Consolidated Steel Corpn.

State of California, 590 tons, highway bridges at Willets and Smiths Point, to McClintic-Marshall Corpn.

San Bernardino, Cal., 140 tons, building for Montgomery Ward & Co., to Consolidated Steel Corpn.

Coco Solo, C. Z., 750 tons, hangar at Navy Base; general contract to H. B. Nelson, Atlanta, Ga., steel placed with an Eastern mill.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Long Island Railroad, 500 tons, bridges at Amityville and Great Neck, N. Y.

Fort Monmouth, N. J., 250 tons, laboratory for United States Signal Corps.

Cambridge, Md., 5000 tons, bridge over Chop Tank River.

State of Pennsylvania, 2000 tons, highway bridges; bids Feb. 9.

Greene County, Pa., 1000 tons, highway bridge; bids Feb. 9, former bids rejected.

SOUTH AND SOUTHWEST

Memphis, Tenn., 450 tons, bridge.

Coal Creek, Tenn., 150 tons, coal screening plant for Tennessee Valley Authority.

Chesapeake & Ohio Railroad, 200 tons, three bridges near Williamsburg, Va.

Fort Bragg, N. C., 500 tons, motor repair and ordnance shop for United States army.

State of Oklahoma, 250 tons, bridges.

CENTRAL STATES

Richland County, Ohio, 150 tons, highway bridge at Lexington. Bids, Feb. 9.

Illinois Central Railroad, 3800 tons, viaduct approach at Cairo, Ill.

Chicago, 400 tons, Ford building at World's Fair.

State of Iowa, 225 tons, bridges.

Bellevue, Iowa, 2200 tons of sheet piling for Lock No. 12, in Mississippi River; James Stewart & Co., low bidders.

WESTERN STATES

Troma, Cal., 350 tons, factory.

Pearl Harbor, T. H., 500 tons, heating plant at Navy Base; bids Feb. 28.

FABRICATED PLATE

AWARDS

Newark, N. J., 100 tons, tunnel plates for Passaic River, to Truscon Steel Co.

St. Johnsbury, Vt., 120 tons, two water storage tanks, to Chicago Bridge & Iron Co.

Washington, 400 to 700 tons, tunnel linings; Piney Branch relief sewer for District of Columbia, to Truscon Steel Co.

Seattle, 100 tons, repairs on steamship Tacoma, to Todd Dry Docks, Inc.

NEW PROJECTS

Two Rivers, Wis., unstated tonnage, 500,000-gal. elevated water tank for city.

Additional Prices on Stainless Steel

NEW prices filed on stainless steel follow: Hot-rolled strip (15 to 18 per cent chrome, 0.10 per cent carbon, 1 per cent silicon, 1 per cent copper) 17c. a lb., Pittsburgh, effective Feb. 5; cold-rolled strip (same analysis as on above) 23c., Pittsburgh, effective Jan. 30. Rerolling billets (carbon 0.12 per cent max., chrome, 15 to 18 per cent, copper, 0.50 per cent min., and silicon, 0.50 per cent max.) 12c. a lb., Pittsburgh; hot-rolled strip (same analysis) 17c.; cold-rolled strip (same analysis) 23c., effective Feb. 6. Rerolling billets (carbon 0.08 to 0.20 per cent, chrome 9 to 12 per cent, and silicon 0.50 to 3.50 per cent) 10½c. a lb., Pittsburgh, effective Feb. 6. Rerolling billets (carbon 0.08 to 0.20 per cent, chrome 12 to 15 per cent and silicon 0.50 to 3.50 per cent) 11¼c., Pittsburgh, effective Feb. 6. Rerolling billets (carbon 0.10 per cent max., chrome 16 per cent, silicon 1 per cent and copper 1 per cent) 12c., Pittsburgh, effective Feb. 6.

ARMSTRONG

TRADE MARK REG. IN U.S. PAT. OFFICE

Drop Forged WRENCHES

There are ARMSTRONG Drop Forged WRENCHES for every job, and each is the finest of its type. Improved designs. Improved steel. Accurate millings. Heat treated, hardened, tempered—STRENGTH. Beautifully finished with heads ground bright and plainly marked for size. These are the wrenches to standardize on for handiness, balance, long service and low tool cost.

39 Types
All Sizes
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There are no "seconds." Each ARMSTRONG Wrench is the finest that can be made.

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"The Tool Holder People"
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ENGINEERS' WRENCHES
15° Angle, Single Head
15° Angle, Double Head
OFF-SET ANGLE WRENCHES
22½° Angle, Double Head
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15° Angle, Single Head
15° Angle, Double Head
HEAVY "S" WRENCHES
22½° Angle, Double Head (Sq.)
22½° Angle, Double Head (Std.)
LIGHT "S" WRENCHES
22½° Double Head
CAR WRENCHES
Double head, extreme length
SET SCREW WRENCHES
22½° Angle, Single Head
22½° Angle, Double Head
MACHINE WRENCHES
Extra Heavy
DOUBLE HEAD TOOL POST WRENCHES
Extra Heavy
Standard, for set screws
HEXAGON BOX WRENCHES
SQUARE BOX WRENCHES
CONSTRUCTION WRENCHES
STRUCTURAL WRENCHES
EXTRA LONG WRENCHES
Round Handle—Flat Handle—Double Head
PIN SPANNERS
"T" HANDLE SOCKET WRENCHES
for Square Nuts and Screws
for Hexagonal Nuts and Screws
SOCKET WRENCHES WITH OFF-SET HANDLE
for Square Nuts and Screws
for Hexagon Nuts and Screws
"GATORGRIP" WRENCHES
Single Head—Double Head

Steel Corporation's Fourth Quarter Shows Increased Deficit

EARNINGS of the United States Steel Corpn. for the quarter ended Dec. 31, 1933, amounted to $5,537,084, compared with $11,816,832 for the third quarter. After charges and allowances for depletion, depreciation and obsolescence and interest charges and also overhead expenses, largely taxes, of ore properties and Great Lakes transportation service, there was a final deficit of $9,746,850, after allowance also for preferred dividends, which were again voted at the rate of 50c. a share. The corresponding total deficit for the preceding quarter was $4,518,419 and that for the fourth quarter of 1932 was $16,633,000.

Accompanying the quarterly statement Chairman Myron C. Taylor issued a statement in part as follows:

The operations for the fourth quarter based on production of finished products for sale was 23 per cent less than in the third quarter, the reduction in tonnage being 457,548 tons. This falling off in shipments explains very largely the lesser earnings reported for the fourth quarter.

For the entire year 1933, the production of finished steel products was 29 per cent of capacity, compared with 18 per cent in 1932, the production in the year just closed having been 5,543,000 tons, as against 3,591,000 tons in preceding year.

For the year 1933 the net deficit in income account after all charges but before dividends was $36,519,000 compared with $71,176,000 in the preceding year. For the year just closed, dividends on preferred stock were declared of $2 per share, totaling $7,205,622, which with the operating deficit aggregated a deficit for the year of $43,724,900. At the close of 1933, the dividend arrearage on preferred stock was 6¼ per cent.

The weighted average price received for domestic shipments throughout the year 1933 was about $5 per ton less than in preceding year, the prices received in many instances being even below cost of production.

Employment at 90 Per Cent

During the fourth quarter employment was given by the corporation and subsidiary companies to an average of 190,430 employees, or about 90 per cent of the total number who normally look to the corporation and its interests for employment. The total pay roll for the fourth quarter of 1933 was $48,852,980, compared with $29,137,419 for corresponding quarter in 1932. Due to the requirements of the steel code, wage rates in the fourth quarter of 1933 averaged an increase of about 24 per cent over the rates prevailing prior to the advances made July 16, 1933, and subsequently.

It is a matter of considerable satisfaction that the working assets position of the corporation at Dec. 31, 1933, was fully equal to the condition of same at close of 1932, the comparison for the respective dates being as follows:

	Dec. 31, 1933	Dec. 31, 1932
Gross working assets	$417,741,717*	$410,382,835
Current liabilities	53,856,558*	46,987,376
Net working assets	$363,885,159	$363,395,459

*Subject to final revisions on complete audit and closing of accounts.

Speeding Orders Between Office and Plant

(*Concluded from Page 17*)

office are first cleared through the sales department and the various other departments having to do with checking the credit, the routing of the finished shipment, and the allocation of the order to a particular mill. After this work is performed, the order is given to the teletypewriter operator for transmission to the plant designated.

The sending machine prints four copies, an original copy, called the "general order department copy;" an "acknowledgment of order copy;" a "district sales copy," and an "invoicing department copy." As the operator types out the order in Youngstown, the machine in one of the mills prints an identical copy. The mill machine makes only one copy, but the form is printed with hectograph ink, and the machine uses a hectograph ribbon. After the order is received at the mill it is often necessary to make notations, and these are made with a hectograph pencil. When the mill order is complete, from six to twenty copies are run off on the hectograph machine, depending on the particular needs of the plant forces.

Orders received in the general order department in the morning are received at the producing mill during the same day. As business increases, and we find the period now set aside for sending orders too short, the flexibility of the teletype system will still permit the allotment of more time to order writing interfering with its use for general message purposes.

A remote control permits the sending of orders, even though the receiving machine is unattended. If the volume of orders demand it, it is also possible to resort to two or three shifts in teletyping the orders to the mills. Orders written during the night are ready the first thing the next morning for the mill force to start immediately working on them.

The installation of teletypewriter service has effected far-reaching economies in our organization, many of which can be calculated in dollars and cents, but probably more important are the incalculable benefits, such as better service to our customers and the increased efficiency which comes from a closer coordination between office and mill and between the number of units in the large organization.

Concrete savings include:

The elimination of checking original mill orders on the part of the mill order forces against preliminary or memo orders, which it was absolutely necessary to forward to the mills prior to the adoption of a teletypewriter order form.

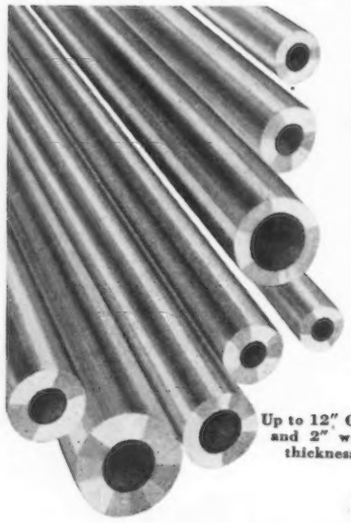
Savings from the elimination of errors, so costly where large items are in the process of production. Each person concerned has an identical copy of the order. The typed copy of the order is checked at the sending office with the original as soon as it is sent. If there has been an error in the typing, it can be corrected immediately by a teletypewriter message.

Savings from the elimination of retyping operations at office or plant. Since the machine makes enough copies for all concerned with the transactions, expensive order-rewriting forces are unnecessary.

Savings in the time of office and plant employees. When queries are made between office and production unit, the inquirer writes out his question and while it is being transmitted over the teletypewriter system for answer he performs other duties. In the meantime, the query having arrived at the plant, the information is obtained and sent back to the office by teletypewriter. These messages also constitute a written record of the progress on any particular job.

Savings promoted by better production control. Orders flow in a steady stream from office to mills. Every day the plant forces know that they have all of the orders received that day, so that they can plan their production.

Savings in mail, messenger and telephone expense. The savings effected with those resulting from the elimination of certain steps in order routine, are almost enough to pay the cost of the entire system.



TOOL STEEL TUBING

NON-SHRINK
OIL HARDENING
NON-DEFORMING

Up to 12" O.D. and 2" wall thickness

for RING DIES
CUTTING DIES
SPACERS, BUSHINGS, Etc.

Manufacturers of BISCO Tungsten Carbide and Tantalum Carbide drawing dies for wire, rod and tubing.

THE BISSETT STEEL CO., INC.
945 E. 67th ST. CLEVELAND, OHIO
Cincinnati Pittsburgh Buffalo

New Source of Iron Ore in Africa

THE Sierra Leone Development Co., Ltd., after preliminary surveys begun in November, 1927, began in November, 1930, the serious development of property located at Marampa, Sierra Leone, in northwest Africa, thus opening an entirely new source of red hematite ore. A 3½ ft. gage railroad connects Marampa with Pepel, which is on the Rokell River about 15 miles above Freeport. At Pepel the company has installed storage and conveying facilities which can load steamers at 2000 tons an hour.

The chemical analysis is as follows:

	Dried at 212 Deg.
Peroxide of iron	84.73 %
Protoxide of iron	.32
Metallic iron	59.56
Silica	2.00
Manganese	.06
Phosphorus	.054
Sulphur	.066
Combined water	5.840

Blast furnace men will be interested in the fact that only 3 per cent of the ore is less than ⅛ in. in size, while 30.5 per cent is 4 to 8 in.

PLANT EXPANSION AND EQUIPMENT BUYING

Foreign Orders Form Better Half Of Machine Tool Demand

AVERAGE machine tool demand continues at a better rate than at any time during 1933, but without any definite indication of market trend. Inquiries are steady and continue to reflect an appreciation, by machine tool operators, of the need of replacing obsolete equipment in the near future.

New business in Cincinnati the past week included a sizable order for upright drills for an automobile manufacturer, a Government order for a planer and miscellaneous orders for lathes, shapers and other tools. A large number of these were supplied from stock.

Cleveland machinery dealers report a heavier volume of inquiry for used tools than at any time during the past six months. Inquiries for new tools in this district have been rather slack during the past week, although a planer builder reports considerable increase in interest.

The report of the National Machine Tool Builders' Association for December, 1933, issued Monday of this week, shows new orders for December at 53 per cent over November, 1933. The index for gross orders for December was 126.2, normal operation of the industry being represented by an index figure of 169. The index for December, 1932, was 35.8. A little over half of the total machine tool business booked in December is for foreign shipment.

NORTH ATLANTIC

Board of Education, Dobbs Ferry, N. Y., plans manual training department in new high school, for which bids will be asked on general contract in February. Cost about $200,000. Knoppe & Morris, 192 Lexington Avenue, New York, are architects.

Borg-Warner Service Parts Co., 111 Eighth Avenue, New York, automobile parts, has leased 3000 sq. ft. additional space in Port Authority Commerce Building, for expansion, making total of 12,000 sq. ft. to be occupied.

Gem Commercial Body Builders, Inc., New York, has been organized by Daniel Mitchell, 3243 Forty-seventh Street, Long Island City, and Abraham Greenberg, 410 East 110th Street, New York, to manufacture metal automobile bodies.

Chapman Docks Co., 1105 Metropolitan Avenue, Brooklyn, has plans for new one-story equipment storage and distributing building, 100 x 105 ft., with pumping plant. Cost about $35,000 with equipment.

Howe Scale Co., 123 Lafayette Street, New York, manufacturer of scales and parts, with main plant at Rutland, Vt., has leased 7500 sq. ft. in Port Authority Commerce Building for new factory branch, storage and distribution.

Presto Recording Corpn., Brooklyn, has been organized by Jacob Graifer, 191 Joralemon Street, and associates, to manufacture recording instruments and devices.

Sterling Distilling Corpn., 21 West Street, New York, an interest of Distillers & Brewers Corpn. of America, Inc., same address, plans extensions and improvements in plant at Peoria, Ill., including equipment. Cost over $50,000 with machinery.

Radio Corpn. of America, 30 Rockefeller Plaza, New York, has plans for new multiplex radiotelegraph broadcasting stations at Boston, Washington, Chicago and New Orleans, and for another group of photogram broadcasting stations at New York, New Brunswick and Trenton, N. J., and Philadelphia, each unit to include steel towers, power station and other mechanical installation. Entire project will cost over $500,000 with equipment.

Tide Water Oil Co., 17 Battery Place, New York, plans rebuilding bulk pumping plant at oil refinery, Constable Hook, Bayonne, N. J., recently destroyed by fire.

Sterling Tool & Die Co., Newark, N. J., has been organized by Valentine J. Waible, represented by Meyer M. Semel, 60 Park Place, and associates, to manufacture tools, dies and kindred products.

John A. Roebling's Sons Co., Trenton, N. J., manufacturer of steel and copper wire rope and cables, has plans for branch plant at California City, Cal., one-story, 115 x 650 ft. Cost about $350,000 with equipment. California offices of company are at 646 Folsom Street, San Francisco.

State Highway Commission, State House, Trenton, N. J., plans new two-story testing station, 128 x 149 ft., at Fernwood, near city, with heavy and light machinery for road material tests. Cost over $50,000 with equipment.

Board of Education, Teaneck, N. J., plans manual training department in new two-story and basement high school. Bids will soon be asked on general contract. Cost over $200,000. Smith & Ward, 100 East Forty-second Street, are associate architects.

Godfrey Mfg. Corpn., New Brunswick, N. J., has been organized by A. D. and Russell E. Watson, 46 Bayard Street, capital $125,000, to manufacture engines and kindred equipment, parts, etc.

Laird & Co., Inc., Eatontown Road, Scobeyville, near Eatontown, N. J., J. R. Laird, head, is considering new distilling plant. Cost about $50,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Feb. 6 for two steering gear control transmission systems and spare parts (Schedule 1589) for Philadelphia Navy Yard.

Glen Alden Coal Co., Plymouth, Pa., has plans for a new five-story industrial and operating building, 25 x 50 ft., with shop facilities, at coal-mining properties. Cost about $45,000 with equipment.

Superintendent of Lighthouses, St. George, Staten Island, N. Y., asks bids until Feb. 5 for one to four sets of air compressors, engine-driven, air-cooled, 75 cu. ft. capacity, complete with air auxiliary and starting compressor; two sets of similar air compressor units (Proposals 45340 and 45329 respectively); until Feb. 6 for two gong buoys, complete with gongs and gong stands (Proposal 45351).

NEW ENGLAND

Board of Education, City Hall, New Bedford, Mass., plans manual training department in new three-story and basement addition to high school. Cost over $400,000. Brown & Poole, Chapman Building, are architects.

Motor Car Co. of New England, 850 Commonwealth Avenue, Boston, representative for Pontiac automobiles, has acquired adjoining building, one-story and basement, about 36,000 sq. ft. floor space, for expansion in service, parts, repair and other departments.

Sutton Tool Co., Inc., Sutton, Mass., has been organized by Wesley F. Morse and George A. Reichenberg, Woonsocket, R. I. (treasurer and representative), to manufacture tools and other mechanical equipment.

Board of Selectmen, Andover, Mass., is arranging fund of $406,000 through Federal aid for addition to junior high school, to include new steam power house for central heating.

Air System Mfg. Co., 237 Connecticut Avenue, Bridgeport, Conn., has been organized by Martin J. Kumnick and Edward Simco, to manufacture air-conditioning equipment and systems.

Coast Guard Headquarters, Washington, asks bids until Feb. 15 for new seaplane hangar, 100 x 100 ft., with additions for shop facilities, at Winter Island, Salem, Mass.

State Department of Mental Diseases, State House, Boston, plans new equipment storage and distributing building at State Hospital, Northampton, Mass. Cost about $95,000 with equipment. Morris W. Maloney, 28 Pearl Street, Springfield, Mass., is architect.

BUFFALO DISTRICT

Canadian Wineries, Ltd., Toronto, Ont., plans new plant at Lewiston, N. Y., for American trade. Cost over $80,000 with equipment.

McCrillis & McKechnie, Inc., Holley, N. Y., has been organized by John P. McCrillis, 6 North Main Street, and William J. McKechnie, 106 Albion Street, to manufacture stoves, ranges, parts, etc.

Sterling Engine Co., Inc., 1270 Niagara Street, Buffalo, Charles A. Criqui, president, has perfected new crankless type Diesel engine unit and plans large output, including parts production and assembling, for motor boat, aircraft, rail cars, buses, trucks and other industrial service.

New York State Electric & Gas Corpn., 123 South Cayuga Street, Ithaca, N. Y., plans new power station and distribution lines at Poundbridge, N. Y., and vicinity. Cost over $60,000 with equipment.

OHIO AND INDIANA

Department of Public Utilities, City Hall, Cleveland, William J. Rogers, director, plans extensions and improvements in municipal electric light and power plant at East Fifty-third Street and Lake front. Cost about $200,000 with equipment.

City Council, Pataskala, Ohio, plans installation of pumping machinery, elevated tank and tower, pipe lines, etc., for municipal water system. Fund of $50,000 has been secured through Federal aid. Burgess & Niple, 568 East Broad Street, Columbus, Ohio, are engineers.

Arthur E. Keller, 2570 Overlook Road, Cleveland, architect, has plans for new three and four-story brewery, 100 x 175 ft., for new company whose name is temporarily withheld. Cost over $300,000 with equipment.

Village Council, Bradford, Ohio, has plans for new municipal electric light and power

plant. Cost over $90,000 with equipment. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Contracting Officer, Material Division, Wright Field, Dayton, Ohio, asks bids until Feb. 7 for one blower assembly (Circular 235), resistors, transformer, voltmeter, ammeter, volt box, etc. (Circular 233); until Feb. 13, brass rods, brass sheets, welding rod brass, brass wire and phosphor bronze rods (Circular 240).

Village Council, Montpelier, Ohio, is arranging fund of $42,724 through Federal aid for extensions and improvements in municipal electric light and power plant, including new equipment.

Buckeye Forging Co., 10003 Harvard Avenue, Cleveland, has asked bids on general contract for one-story addition, including improvements in present unit. Christian, Schwarzenberg & Gaede, 1836 Euclid Avenue, are architects.

Board of Trustees, Indiana State Teachers College, Terre Haute, Ind., plans installation of forced-draft stokers, air compressors, vacuum pumps and other equipment in power house for new college building in Hemingway Park. Fund of $400,000 has been arranged for entire project. Miller & Yeager, 819 Ohio Street, are architects.

Muncie Gear Works, Inc., Muncie, Ind., has been organized by Wiley W. and Kenneth A. Spurgeon, Muncie, to manufacture transmission systems, gears and kindred products.

Town Council, Milltown, Ind., plans installation of pumping machinery and auxiliary equipment, pipe lines, fittings, etc., for municipal water system. Cost $64,000. Fund is being secured through Federal aid.

Sternberg Automotive Parts Mfg. Co., Inc., 4909 Hohman Avenue, Hammond, Ind., has been organized by Maxwell S. Sternberg and Charles N. Nau, to manufacture automobile parts and equipment.

Jordan Welding & Mfg. Co., Cleveland, manufacturers of upset forgings, special bolts and screw machine products, has recently secured the Ferrell Brake & Mfg. Co. and has moved into the latter plant on Cassius Avenue.

SOUTH ATLANTIC

Eastern Cotton Oil Co., Hertford, N. C., plans rebuilding steam power house and other parts of plant recently destroyed by fire. Loss over $60,000 with equipment.

Board of Education, Miami Beach, Fla., plans manual training department in new senior high school. Cost about $200,000 with equipment. A. Geiger, 710 Lincoln Road, is architect.

Brown Portable Electric Grease Gun, Inc., Charlotte, N. C., has been organized, capital $100,000, by W. H. Powlas and W. C. Honeycutt, Charlotte, to manufacture mechanical equipment and devices.

Common Council, Calhoun Falls, S. C., plans installation of pumping machinery and auxiliary equipment for municipal water system. Fund of $72,000 has been arranged through Federal aid.

Tampa Shipbuilding & Engineering Co., Tampa, Fla., has plans for new dock and shop units. Cost about $750,000 with equipment. It is proposed to begin work in March.

Oxford Buggy Co., Oxford, N. C., plans purchase of parts and equipment for production of line of trailers, from 2 to 5-tons capacity, including axles, spring shackles, brake equipment, etc.

Common Council, Trenton, Fla., plans installation of deep-well pumping machinery, 30,000-gal. elevated steel tank and tower, pipe lines, meters and other equipment for municipal waterworks. Financing has been arranged.

WESTERN PENNA.

Fayette Brewing Co., Uniontown, Pa., recently taken over by Pitt Investment Co., has work under way on remodeling and expanding plant for distillery. Cost about $100,000 with machinery.

West Side Business Men's Association, Charleston, W. Va., Walter M. Lynch, secretary, is at head of project to erect a new municipal electric light and power plant. It is proposed to arrange financing through Federal aid.

United States Engineer Office, Huntington, W. Va., asks bids until Feb. 9 for steel launch, 40 ft. long and 8 ft. wide.

Common Council, Moorefield, W. Va., plans installation of pumping machinery, filtration equipment, pipe lines, fittings, etc., for new municipal waterworks. Fund of $50,000 has been secured through Federal aid.

WASHINGTON DISTRICT

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Feb. 8 for two horizontal two-stage motor-driven air compressors at Naval Fleet Air Base and Navy Yard, Pearl Harbor, T. H., and for one similar air compressor at Navy Yard, Mare Island, Cal. (Specification 7571).

Baltimore Crown Co., Inc., 1750 Baltimore Trust Building, Baltimore, has been organized by Jerome T. Stach and associates, capital $250,000, to manufacture metal bottles, seals and caps, bottle-sealing equipment, etc.

Montgomery County Board of Education, Rockville, Md., plans manual training department in new two-story high school. Cost about $180,000. H. W. Cutler, 1108 Sixteenth Street, Washington, is architect.

Board of District Commissioners, District Building, Washington, asks bids until Feb. 9 for traffic signal control equipment.

Division of Purchase, Sales and Traffic, Department of Agriculture, Washington, asks bids until Feb. 14 for steam power house, in conjunction with new cold storage laboratory and other buildings at Bureau of Plant Industry, Beltsville, Md. (Proposal 5700).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Feb. 6 for one motor-driven metal-cutting bandsaw (Schedule 1639) for Norfolk, Va., Navy Yard; steel boiler tubes (Schedule 1610) for Norfolk, Mare Island and Puget Sound yards; butchers' knives, paring knives and butchers' steels (Schedule 1620) for Brooklyn Navy Yard.

Board of Trustees, University of Virginia, University, Va., plans new group of engineering buildings, one and two stories, including metal-working shops, tool rooms, metallurgical, electrical, hydraulics, fuel and oil and other laboratories, instrument rooms, wood-working shops, etc. Cost $379,000 with equipment. Financing has been arranged through Federal aid. Edmund S. Campbell, head of School of Art and Architecture at institution, is architect; Walter D. Blair, 154 East Sixty-first Street, New York, is associate architect.

A. L. Meisel, city manager, City Hall, Williamsburg, Va., asks bids until Feb. 6 for refuse incinerator plant, including machinery, stack, etc. Wiley & Wilson, People's National Bank Building, Lynchburg, Va., are consulting engineers.

SOUTH CENTRAL

Tom Moore Distilling Co., Bardstown, Ky., plans extensions and improvements, including equipment, for production, storage and distribution. Cost about $50,000 with equipment.

Common Council, Auburn, Ky., plans installation of pumping machinery and auxiliary equipment, pipe lines, etc., for extensions and improvements in municipal water system. Cost $48,000. Federal financing has been arranged.

J. W. McCulloch Distilling Co., Inc., Owensboro, Ky., has been organized by J. Wendell McCulloch, Bowling Green, Ky., and J. Freeman Little, Owensboro, to take over McCulloch's Green River Whiskies, Inc., Owensboro, lately reorganized. Company has plans for new works on 20-acre tract on Ohio River, with power house and machine shop. Cost over $250,000 with equipment.

Board of Works, Gretna, La., plans pumping plant, elevated steel tank and tower, filtration plant, pipe lines, fittings, etc., for extensions and improvements in municipal water system. Fund of $269,000 has been secured through Federal aid. Swanson-McGraw, Inc., Balter Building, New Orleans, is consulting engineer.

Friedman-Keiler Co., Paducah, Ky., L. F. Keiler, head, has plans for new distillery. Cost about $65,000 with equipment.

American Commercial Alcohol Corpn., 405 Lexington Avenue, New York, plans extensions and improvements in plant at Gretna, La. Cost over $50,000 with equipment.

MICHIGAN DISTRICT

Schmidt Brewing Co., Wilkins Street, Detroit, has plans for new brewery unit on adjoining site, including modernization of present plant. New steam power house will be built. Entire project will cost about $450,000 with equipment, which will more than double present output. G. A. Mueller, 1346 Broadway, is architect and engineer.

Goebel Brewing Co., Rivard Avenue and Maple Street, Detroit, has filed plans for addition to bottling plant. Cost over $40,000 with equipment. Harley & Ellington, Stroh Building, are architects and engineers.

Automatic Timer Corpn., 923 Ludington Street, Escanaba, Mich., has been organized by William H. Needham, Escanaba, and associates, to manufacture electric timers and kindred equipment.

Berrien County Brewing Co., Benton Harbor, Mich., has asked bids on general contract, through M. F. Strauch, 3836 Lincoln Street, Chicago, architect, in charge, for extensions and improvements, including equipment. Cost over $80,000 with machinery.

SOUTHWEST

White Eagle Oil Corpn., Federal Reserve Bank Building, Kansas City, Mo., plans new bulk oil storage and distributing plant. Cost over $40,000 with equipment. J. V. Clark, address noted, is company architect.

Little Rock Brewery, Little Rock, Ark., care of T. H. Eslick, Little Rock, representative, has plans for new plant, including storage and distributing units. Cost about $175,000 with equipment. It is proposed to ask bids early this month.

Foley & Hallquist Die Co., Inc., St. Louis, has been organized by Thomas W. Foley and associates, capital $50,000, to manufacture dies and kindred products. New company will take over and expand Foley & Hallquist, 1516 North Seventeenth Street, specializing in similar products.

City Council, Muskogee, Okla., is arranging special election in April to approve bonds for $1,260,000 for new municipal electric light and power plant, using Diesel engine-generator units. Federal financing will be arranged. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Board of Trustees, Oklahoma Military Academy, Claremore, Okla., has approved plans for one-story hangar, 107 x 115 ft., with reconditioning and repair facilities. Joseph R. Koberling, 569 South Peoria Avenue, Tulsa, Okla., is architect.

National Drill Equipment Corpn., St. Louis, has been organized by Thomas F. Colfer and Philip A. Rohan, 23 Windimere Place, to manufacture drills and kindred equipment.

Constructing Quartermaster, San Antonio, Tex., has asked bids on general contract for new engine test hangar and mechanical shop at Duncan Field, Tex. Appropriation of $37,089 is available for unit, including equipment.

Phoenix Refining Co., 1801 South Laredo Street, San Antonio, Tex., has approved plans for new oil refinery near city limits. Cost over $85,000 with equipment.

Board of Education, Fort Worth, Tex., plans manual training department in new two-story and basement senior high school in North Side district. Cost $418,000 with equipment. Wiley G. Clarkson & Co., First National Bank Building, are architects. E. P. Williams, 409 East Weatherford Street, is business manager for board.

MIDDLE WEST

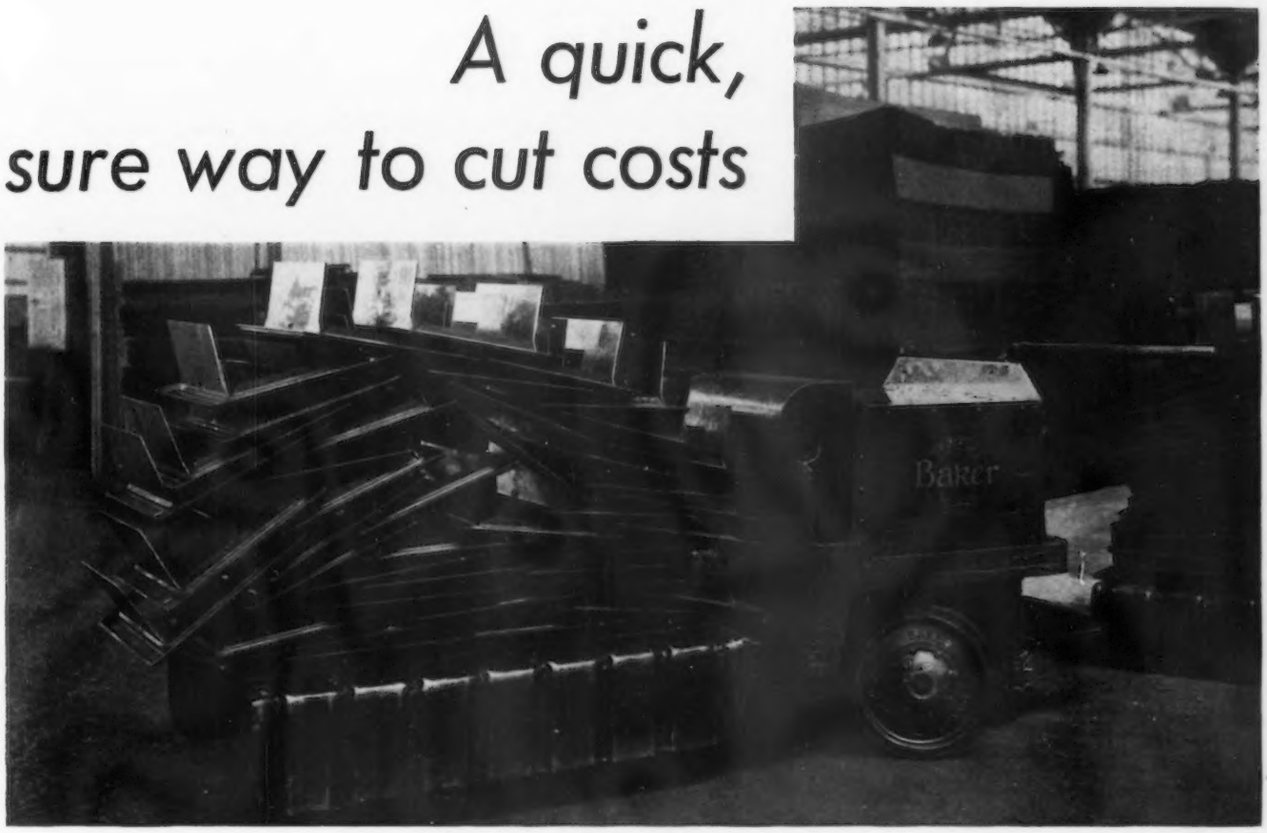
School District No. 113, Lake Forest, Ill., care of Anderson & Ticknor, Lake Forest, architects, plans manual training department in new two-story and basement high school. Cost $350,000. Financing has been arranged.

Public Works Department, City Hall, Chicago, has plans for new pumping plant, 62 x 192 ft. Cost $782,000 with machinery. Paul Gerhardt, Jr., 64 West Randolph Street, is architect.

Champion Furnace Pipe Co., 912 Jefferson Building, Peoria, Ill., has been organized by William D. Upton and Joseph F. Bartley, Peoria, to manufacture furnace equipment, pipe and allied products.

Range Brewing Co., 101 Howard Street, Hibbing, Minn., is arranging financing for

A quick, sure way to cut costs

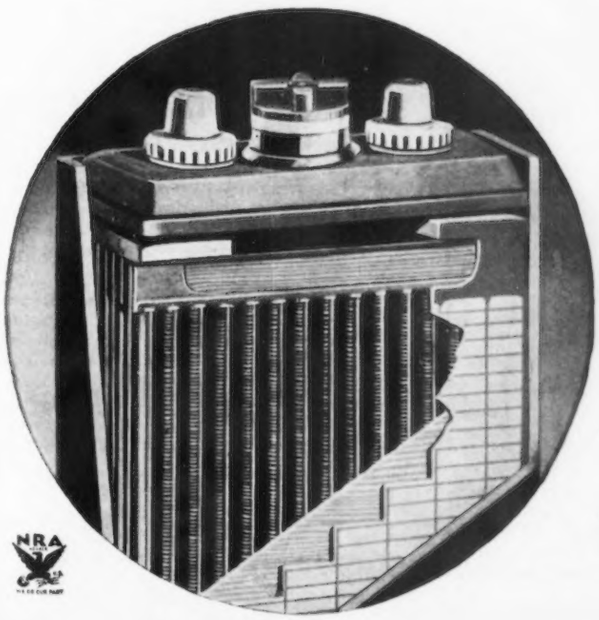


With the use of skids, the Elevating Platform Truck handles more materials per unit

For transportation in and about almost any plant, electric industrial trucks and tractors offer a means of handling more materials per hour at considerably lower cost. As high as 100% saving on the investment inside of six months is not an unusual record.

Special trucks are available for specific jobs within each industry—hundreds of different types. You can readily find an electric truck or tractor that exactly fits your needs.

It is vitally important to select the right battery for this service. Exide-Ironclad Batteries, with their tremendous reserve power and long life, are playing a major part in cutting costs in thousands of industrial trucks. Exide-Ironclads maintain their voltage and keep trucks in efficient operation throughout the day. They can deliver current at useful voltages up to many times the normal discharge rate — a great surge of power when needed. And during their long life, they require minimum care and attention.



We will gladly furnish information about Exide-Ironclad Batteries and their application in industrial truck and electric switching locomotive service.

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IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

about $200,000, proceeds to be used for extensions and improvements in four-story plant, including tanks, vats, brewing machinery, conveyors, refrigerating machinery, piping and other equipment. Ralph W. Richardson, New York Life Building, St. Paul, Minn., is architect and engineer.

Bureau of Reclamation, Denver, asks bids until March 9 for two 3000-kva. generators, complete with main exciters, spare parts, etc.; also for 11 transformers for high voltage and accessory equipment for Boulder power plant (Specification 565).

City Council, Minot, N. D., is considering early special election to approve bond issue of $900,000, for new municipal electric light and power plant.

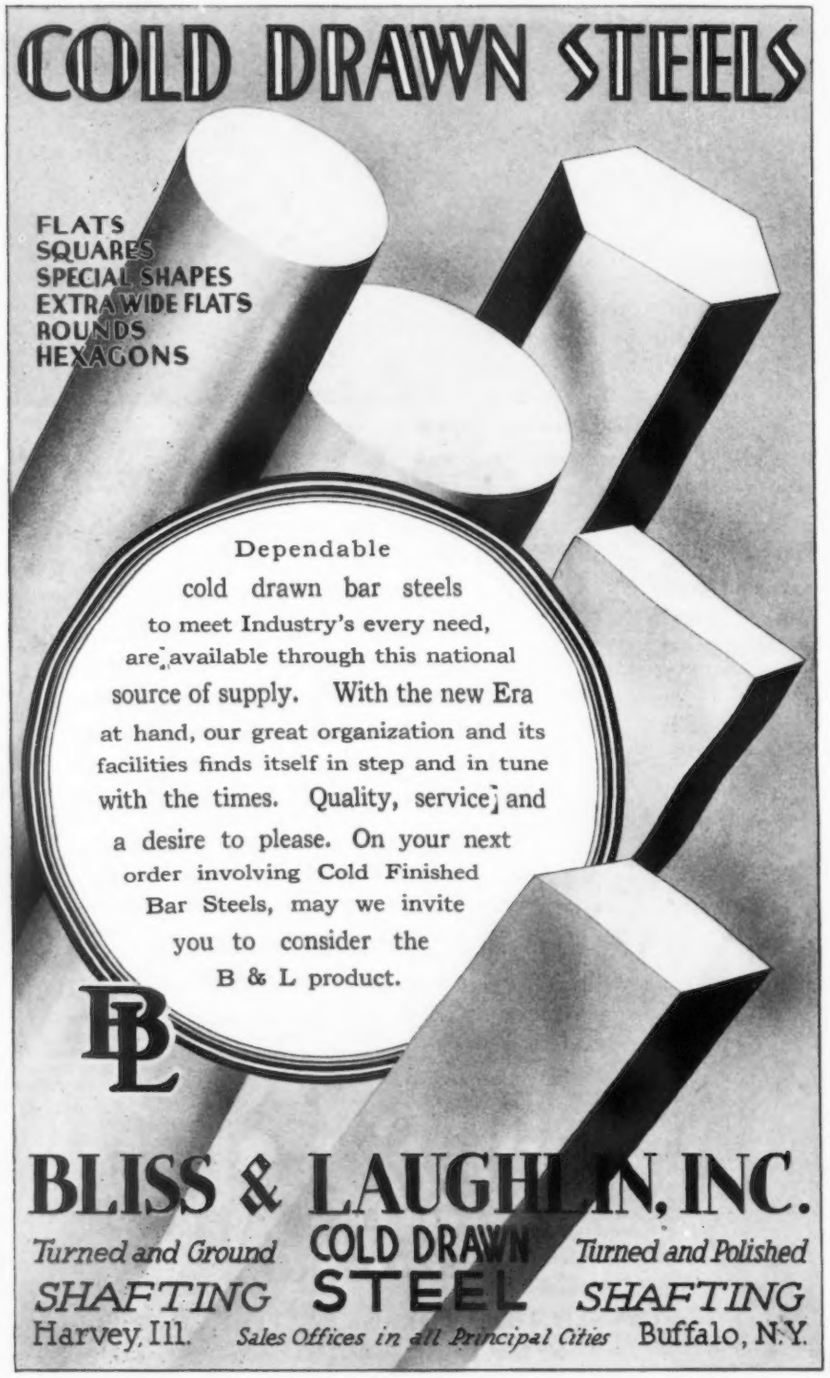
Firestone Tire & Rubber Co., Akron, Ohio, has leased two-story and basement building, 100 x 100 ft., to be erected at Tenth and Walnut Streets, Des Moines, Iowa, for new factory branch, storage and distributing plant. Cost about $75,000 with equipment. Proudfoot, Rawson, Borg & Brooks, Hubbell Building, Des Moines, are architects. Local offices of company are at 1013 Walnut Street.

City Council, Winthrop, Minn., plans new municipal electric light and power plant. Cost about $75,000 with equipment. Financing is being arranged through Federal aid. Ralph W. Richardson, New York Life Building, St. Paul, Minn., is architect and engineer.

Jordan Breweries, Inc., Jordan, Minn., has plans for new one-story bottling works, 30 x 120 ft., and will ask bids on general contract early in spring. Wesley G. Wells, 1455 Edmund Street, St. Paul, Minn., is architect.

City Council, Two Rivers, Wis., is arranging for Federal loan of $240,000 for new municipal electric light and power plant. Plans being completed by Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., consulting engineer.

City Council, St. Paul, Minn., has called special election March 6 to vote bonds for $10,230,000 for new municipal electric light and power plant, designed to furnish about 40 per cent of light and power requirements of city.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FLATS
SQUARES
SPECIAL SHAPES
EXTRA WIDE FLATS
ROUNDS
HEXAGONS
Dependable cold drawn bar steels to meet Industry's every need, are available through this national source of supply. With the new Era at hand, our great organization and its facilities finds itself in step and in tune with the times. Quality, service and a desire to please. On your next order involving Cold Finished Bar Steels, may we invite you to consider the B & L product.
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BLISS & LAUGHLIN, INC.
Turned and Ground SHAFTING
COLD DRAWN STEEL
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Harvey, Ill. Sales Offices in all Principal Cities Buffalo, N.Y.

◀ PACIFIC COAST ▶

Mount Tivy Winery, Inc., Rowell Building, Fresno, Cal., Lucius Powers, Jr., president, plans extensions and improvements, including new machinery and bottling equipment. Cost about $90,000.

Abba Gold Mining Corpn., Los Angeles, care of Max E. Socha, 1236 South Keniston Street, president, is arranging financing to total about $5,000,000, for acquisition of gold and silver mining properties near Carson City, Nev., and installation of machinery for mining, milling and other operations. Thomas W. Cochran, Hollywood, Cal., is treasurer.

Sonoma Valley Brewing Co., 217 Exchange Bank Building, Santa Rosa, Cal., will soon take bids on general contract for new local plant. Cost $175,000 with machinery.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Feb. 6 for 7500 snap-bolt hooks (Schedule 1571), motor-driven pipe-threading and cutting machine (Schedule 1599) for Mare Island Navy Yard; two motor-driven turret lathes (Schedule 1586) for Puget Sound yard; wire rope marline spikes (Schedule 1611) for Mare Island and Puget Sound yards; stencil-cutting machines (Schedule 1612) for Mare Island and San Diego yards; until Feb. 9, motor-driven milling machine and equipment (Schedule 1635) and motor-driven combination punch, shear, coper and notcher (Schedule 1641) for Mare Island yard.

Northwest Brewing Co., 105 East Twenty-sixth Street, Tacoma, Wash., has filed plans for five-story addition, to include installation of equipment. Cost about $100,000 with machinery. Peter Marinoff is president.

St. George Winery, Fresno, Cal., plans extensions and improvements in plant, including equipment. Cost about $35,000 with machinery.

Costa Mesa High School District, Costa Mesa, plans new one-story vocational shop unit, 35 x 102 ft. E. H. Mackie and John P. Perrine, Western Pacific Building, Los Angeles, are architects and engineers.

◀ FOREIGN ▶

British Bemberg, Ltd., London, England, manufacturer of cellulose rayon products, is acquiring additional property adjoining plant at Lancaster, England, for extension. Cost over $200,000 with equipment.

Municipal Clerk, Mackay, Australia, asks bids until May 1 for pumping machinery and auxiliary equipment for municipal sewage works. A. E. Harding Frew, Queens Street, Brisbane, Australia, is engineer.

Government of Brazil, Rio de Janeiro, has let contract to Waco Aircraft Co., Troy, Ohio, for 25 new cabin-type airplanes and parts, totaling $250,000, for airmail service. This makes a total of 114 airplanes furnished by company to Brazilian Government.

Palestine Potash Co., Ltd., Jerusalem, Palestine, is planning construction of new sulphuric acid plant. Cost about $300,000 with machinery.

TRADE PUBLICATIONS

Mechanical Packing. — American Metallic Packing Co., Pittsburgh. New catalog describing metallic packing equipment for every standard use in connection with steam, air, gas, ammonia, and carbon dioxide. Special design packing equipment may be secured for high pressure compressors.

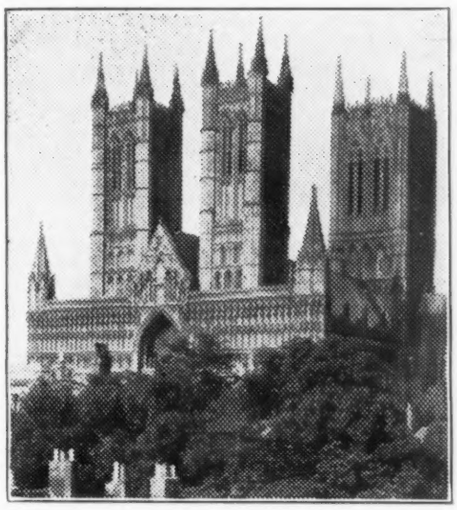
Phosphor Bronze and Nickel Silver.—Riverside Metal Co., Riverside, N. J. Illustrated folder describing free-cutting phosphor bronze and nickel silver. The metals have diverse applications, possess excellent physical and manufacturing characteristics, and find wide application for parts requiring good strength combined with corrosion resisting properties.

Speed Reducers.—Falk Corpn., Milwaukee. Catalog describing various types of Motoreducers designed for combination with standard makes of motors. Equipment features interchangeability, high efficiency, and broad range of gear ratios.

The Properties of LEAD

No. 2
Of A Series

ATMOSPHERIC CORROSION RESISTANCE



The leaded pinnacles, gutters and parapets of the Lincoln Cathedral, England, are in excellent condition after more than 500 years' exposure.

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CHEMICAL LEAD
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HERCULANEUM
DESILVERIZED LEAD
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SUPER-REFINED LEAD
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CORRODING LEAD

Tests on atmospheric corrosion of metals indicate that Lead is practically unsurpassed in resistance to this type of corrosion. Lead, and its antimony alloy, have few equals among the nonferrous metals commonly used where atmospheric corrosion is of importance.

Typical is the following table showing the results of one series of tests. The specimens were exposed to the industrial atmosphere of Birmingham, England, for a period of seven years. Details of the test, and a copy of the complete table will be sent on request.

Metal	Composition per cent	Loss as per cent of original weight	Remarks
Lead, antimonial	Sb 1.6	0.011	Perfect Condition
Tin	Sn 99.75	0.070	Closely adherent; white deposit under black coating.
Lead, soft	Pb 99.96	0.086	Perfect Condition
Stainless Steel	Cr 12-13	0.10	Excellent Condition
Aluminum	Si 0.25	0.113	White deposit under black coating; tenaciously adherent.
Copper, "arsenic free"	As 0.01	0.230	Green stain under black coat; tenaciously adherent. Metal surface in excellent condition
Zinc	Zn 99.82	0.539	Small pinhole pitting.

This high resistance of Lead to atmospheric corrosion is largely responsible for its extensive use in the manufacture of roofing, ornamental work, flashings and spandrels. The use of Lead as sheathing for overhead cables is an outstanding example of an application where the metal's atmospheric corrosion resistance is an important but secondary reason for the application.

ST. JOSEPH LEAD COMPANY
250 PARK AVE. NEW YORK, N.Y.
The COUNTRY'S LARGEST PRODUCER of DOMESTIC PIG LEAD

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• GRABS and other below the hook necessities must be Quality Products

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• *The Screw Type Piercing Grabs illustrated above are the latest addition to our list of Below the Hook Necessities.*

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TRADE NOTES

Johnson Bronze Co., New Castle, Pa., has opened new warehouse at 171 Lafayette street, New York, where complete stock of general purpose bronze bushings and bars will be carried to serve the industrial trade in Eastern New York, northern New Jersey and New England. The warehouse is in charge of R. C. Clarke, district manager.

L. D. Harkrider, secretary-treasurer and acting general manager of the Glancy Malleable Corpn., Waukesha, Wis., has been appointed receiver of the corporation on application of a judgment creditor, with consent of company, in a Waukesha County Court proceeding. It was stated by Mr. Harkrider that there is $135,000 outstanding in unsecured claims and that a $160,000 insecured first mortgage bond issue was defaulted Nov. 1. The receiver will continue to operate the plant.

Joseph T. Ryerson & Son, Inc., operating steel-service plants in principal industrial centers, has been appointed by Inland Steel Co., Chicago, as exclusive sales agent for steel sheet piling in Ohio, West Virginia, Pennsylvania, New York, New Jersey, Maryland, Delaware, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, Maine, Kentucky and the District of Columbia.

Hess-Bright Mfg. Co., Philadelphia, has discontinued its name and all future trading will be done under the name of SKF Industries, Inc., Front Street and Erie Avenue, Philadelphia.

The Paper & Textile Machinery Co., Sandusky, Ohio, effective immediately, will be known as the Sandusky Foundry & Machine Co., the name under which it began business in 1904. No change in ownership or management is involved.

Morrison-Drabner Steel Co., Cincinnati, recently organized by Roger Morrison and Victor Drabner, have established a warehouse at 1065 Summer Street and will carry a line of sheet steel and tubing.

McFarland Foundry & Machine Co., Trenton, N. J., has changed its name to Trenite Corpn.

The American Cyanamid Co., 535 Fifth Avenue, New York, has leased about 120,000 sq. ft. in the new R.C.A. Building at 30 Rockefeller Plaza, New York, and expects to occupy new quarters about April 1, 1934.

Rodney Davis, 624 Race Street, Philadelphia, has been appointed distributor for Diamond roller chains, sprockets, couplings and special chains in the Philadelphia district, by the Diamond Chain & Mfg. Co., Indianapolis.

Inland Steel Co., Chicago, has appointed Pidgeon-Thomas Iron Co., Memphis, Tenn., as exclusive agent in the sale of steel sheet piling in Memphis and the surrounding territory in western Tennessee.

Ault & Wiborg Corpn., New York, has taken over lacquer division, including most important manufacturing and sales personnel and accounts receivable, of Van Schaack Brothers Chemical Works, Inc., hitherto located at 3358 Avondale Avenue, Chicago, and will continue to operate it as its Van Schaack Division, eventually transferring manufacturing activities to Cincinnati.

J. B. Engineering Sales Co., New Haven, Conn., has been appointed representative in Connecticut for the sale of flexible couplings made by the Poole Foundry & Machine Co., Woodberry, Md.

Pacific Steel Boiler Corpn., a subsidiary of United States Radiator Corpn., has appointed L. J. Tierney Co., 1425 Statler Building, Boston, its direct sales representative.

HERE ARE FACTS
that show how National Tubes cut down maintenance costs

Fact 1 — Seamless—no welds.
Fact 2 — Unusual strength and ductility.
Fact 3 — Uniform metallic structure.
Fact 4 — High resistance to corrosive attack.
Fact 5 — Readily expanded, rolled, and beaded.

Begin today to take advantage of these facts, which mean a lower-cost tube service. In addition to increased economy, you will find that such annoyances as schedules broken, operations deranged, and time lost for repairs will be reduced to a minimum. Whether for locomotive, stationary, or marine boiler service, maximum security and economy will be found in NATIONAL-SHELBY Tubes—

America's Preferred Boiler Tubes

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

NATIONAL SEAMLESS

BOILER TUBES—SAFE ENDS—SUPERHEATER TUBES—CONDENSER TUBING—ARCH TUBES—SUPERHEATER PIPES—STAY-BOLT MATERIAL

Industrial Chromium Plating

(*Concluded from Page* 15)

and tantalum are the only commercial products that have superior wear-resisting properties.

Chromium occludes at least 250 times its volume of hydrogen in the deposition process. The gas (or metal) undoubtedly is in solid solution with the chromium and, in effect, forms an alloy. This combination is extremely brittle, but as indicated above, it also manifests the desirable wear-resisting properties. Schneidewind has shown that plated pieces subjected to increasing temperatures do not change in surface hardness until a somewhat critical range of 525 to 550 deg. F. is reached. In that range a marked falling off in hardness occurs. This seems to prove that the hydrogen is not merely absorbed, for it would have been driven off at a temperature well below 525 deg. F. if this were so. In this range the Bierbaum scratch width increases from 2 microns to 4 microns. At temperatures above this range there is a gradual falling off in hardness. After heating to 1920 deg. F., the plate shows a scratch width of 5.5 microns and a Mohs reading of 4.5. The Vickers-Brinell after this thermal treatment is approximately 150 and the plate is characterized as being fully annealed. Cast chromium has the same physical properties as the plate in this condition, being soft, ductile, malleable and without desirable wear resisting properties.

Low Coefficient of Friction

Chromium plate has a very low coefficient of friction as indicated by the following table:

	Static	Sliding
Chromium plate on chromium plate	0.14	0.12
Babbitt on chromium plate	0.15	0.13
Babbitt on steel	0.25	0.20

Chromium plate is not affected by organic chemicals, alkalies, sulphur and sulphur compounds. Nitric acid in any concentration will not react with it. However, both hydrochloric and sulphuric acids readily dissolve the plate. Its passivity undoubtedly can be attributed to the formation of an extremely thin film of chromium oxide, since the metal is readily oxidized. However, the plate, and as a consequence, the oxide film, is apt not to be continuous, as fine cracks and porosity in the form of pin holes develop in plating. This tendency becomes more marked with the heavier plates. Thus, chromium directly on steel does not offer complete protection against corrosion. As was referred to above, the depth of plate employed in the decorative scheme, namely, 0.00002 in. to 0.00004 in., when properly applied, is freer of these defects than plate of greater thickness. Corrosion will develop through these leaks. However, in ordinary service, parts plated for wear resistance resist corrosion quite well. Often the decorative plate is used under conditions that call for corrosion as well as wear resistance. This plate will break down readily and show early failure. The chromium deposit is so shallow that plastic deformation of the soft under-coats takes place, with accompanying flaking of the chromium plate. The heavy wear resisting plate applied directly to the base metal is a better choice for this type of service. In fact, heavy deposits applied locally on stainless steel are being used to accomplish this combination effect.

Heavier Plate for Severe Requirements

An excellent illustration is the chromium plated golf club head. Some manufacturers make these of soft steel, with decorative plate finish. This finish will remain intact for only a few strokes in the sand trap. Several have changed to a heavier plate of approximately 0.0003 in. to 0.0005 in. in depth applied directly to the steel, with consequent better all around performance.

Chromium melts at 2930 deg. F. and will retain a bright surface up to 1200 deg. F. It therefore serves well on some high temperature applications. However, since its coefficient of expansion is less than that of most metals (it is about the same as glass) flaking of plate might be experienced at the elevated temperatures. Chromium plate on cast iron forms a useful combination and is employed for glass molds. The following table lists the linear coefficient of expansion of the more common metals:

Expressed as increase in length per unit length per one degree centigrade x 10^{-6}

Aluminum	24	Lead	28
Cadmium	29	Nickel	14
Chromium	8.7	Silver	19
Copper	17	Tin	21
Iron (cast)	10	Tungsten	5
Iron (steel)	11	Zinc	26

The melting points and specific gravities of the more common metals are as follows:

	M. P. Deg. F.	Sp. G.
Aluminum	1217	2.70
Cadmium	609	8.64
Chromium	2939	6.92
Cobalt	2696	8.71
Copper	1981	8.80
Gold	1945	19.32
Iron	2786	7.88
Lead	621	11.33
Nickel	2646	8.90
Platinum	3191	21.16
Silver	1761	10.53
Tin	449	7.29
Tungsten	6152	19.6
Zinc	787	7.14

Chromium has approximately the same heat conductivity and electrical conductivity as aluminum, and approximately half that of copper and silver. Chromium in itself is non-magnetic which opens a new field in making non-ferrous electrical parts longer wearing.

A.S.T.M. Issues Book of Tentative Standards

THE American Society for Testing Materials has issued the 1933 edition of its book of tentative specifications, methods of test and definitions of terms. The publication contains 223 tentative standards. Of these 47 are published for the first time, while some 41 were revised in 1933 and are given in their latest approved form.

Steel for bridges and buildings (60,000-72,000 grade); mild steel plates (55,000-65,000 grade of steel); high tensile strength carbon steel plates; alloy steel and carbon steel castings; elliptical springs; lap-welded and seamless steel pipe for high-temperature service; zinc coating on hardware and fastenings; wrought iron rivets and magnesium ingot and stick for remelting are among the new standards.

New tentative test methods include the impact testing of metallic materials, short-time high-temperature tension tests, and "creep" tests. Revisions cover in part—aluminum, aluminum-alloy (Duralumin), and aluminum-manganese alloy sheet and plate; zinc-base alloy die castings; metallic materials for electrical heating (chemical analysis).

The book has a complete subject index and two tables of contents, designed to facilitate the use of the book, one listing the items under the general materials covered, the other in numeric sequences of their serial designation. The publication contains 1136 pages. Copies in cloth binding at $8 each, or in heavy paper cover, $7, can be obtained from A. S. T. M. headquarters, 260 South Broad Street, Philadelphia.

IT

A *vital* WIRE CHARACTERISTIC

Wire does have personality . . . definite characteristics that make one wire desirable for a particular purpose and another undesirable even though both wires are manufactured in strict conformity to the same specifications. What puts this subtle something into the wire? A most far-reaching study of wire structures, their causes and the resulting actions of various wires of the same specification, has conclusively proven to us that a wire to perfectly fit, to be the best possible wire for a purpose, must be not only to specifications, but beyond specifications. The results of this research are available to you . . . to give you a wire better for your particular use. Don't you want to hear about IT?

WICKWIRE SPENCER STEEL COMPANY
41 East 42nd Street, New York City; Buffalo, Chicago, Detroit, Philadelphia, Tulsa, Worcester; Pacific Coast Headquarters: San Francisco; Warehouses: Los Angeles, Seattle, Portland. Export Sales Department: New York City.

WISSCO WIRE
by Wickwire Spencer

NRA MEMBER U.S. WE DO OUR PART

Wickwire Spencer manufactures High and Low Carbon Wires—in various tempers, grades and finishes—for your specific purpose. Hard-Drawn, soft or annealed Basic or Bessemer Wires—Hard-Drawn annealed, or oil-tempered Spring Wire, Chrome Vanadium Spring Wire—Valve Spring—Music—Clip—Pin—Hairpin—Hook and Eye—Broom—Stapling—Bookbinding—Machinery Spring Wire—Reed Wire—Clock—Pinion—Needle-Bar—Screw Stock—Armature Binding—Brush—Card—Florist—Mattress—Shaped—Rope—Welding. Flat Wire and Strip Steel, High or Low Carbon—Hard, annealed or tempered—Clock Spring Steel—Corrosion and Heat Resisting Wires. Consult the Wissco technical man on your wire problems, however large or small.

Lubrication of Rolling Mill Gear Units

(*Concluded from Page 21*)

matter, some water and some light-grade oil so that the exact amount of interchange is probably less than 2 gal. for the entire ten units.

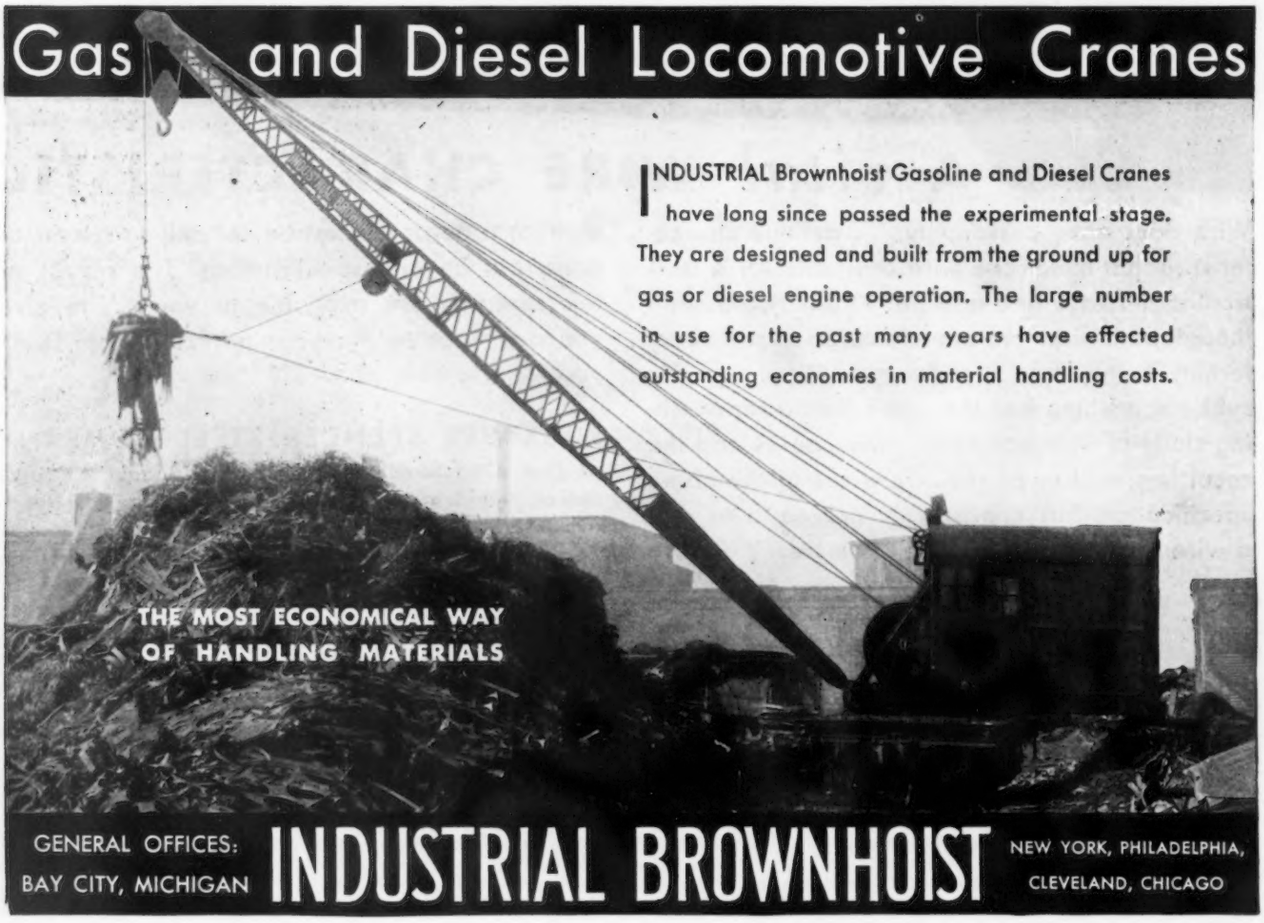
Where there are a number of gear units in close proximity and conditions of service are similar, it is undoubtedly more satisfactory to use one central system than to use individual systems. Better filters may be used with the central system and duplicate pumping mechanisms, and due to the larger volume of oil continuously circulated throughout the entire system, the general temperature of the oil is lower. Most central systems are inexpensively equipped with coils so that they may be connected to the water system in summer and to the steam pipes in winter, but it is much more difficult to arrange this system of cooling and heating with individual systems for each unit.

The influence that anti-friction bearings have on lubricating systems is well worth attention. The gear maker will almost invariably prefer the anti-friction bearing because a much heavier lubricant may be used in one central system than with plain bearings and the same lubricant can be applied to both bearings and gears. This removes the expense of complicated baffle arrangements and offers greater protection to the gears. Roller bearings are more satisfactory on gear drives because they are precision made, thus necessitating accuracy of gear alinement which, of course, insures perfect tooth action; and since they do not wear appreciably if selected with sufficient margin of safety, the gears are held in perfect alinement permanently.

It is sometimes difficult to arrange pinion stands for four-high mills for roller bearing mounting due to the very small space between the necks of the pinions. There has been developed a design here illustrated (Fig. 1), showing the staggered arrangement, which is very ingenious. The end thrust from each pinion is taken on tapered roller bearings of adequate size and the bearings so offset that there is no more distance between the bearings than there would be with plain bearings arranged with baffles. The top left-hand bearing housing is a duplicate of the bottom right hand and the top right hand a duplicate of the bottom left hand, so that the pinions may be turned around the same as if plain bearings were used.

A development of this principle is applied to a combination pinion stand and main drive for medium and small size mills. This arrangement is illustrated in Fig. 2. Every bearing is amply large for the service, the shafts are adequate for the torque, and the deflection between bearings is well within permissible limits. Drives of this type are arranged for force feed-lubrication from an individual system.

The new No. 81 internal grinding machine offered by the Heald Machine Co., Worcester, Mass., for small work, is described in an unusually attractive 20-page booklet recently issued. The large illustrations, made from unretouched photographs and bled off the pages, clearly show all details of construction. The type is large and is effectively arranged.


Gas and Diesel Locomotive Cranes
INDUSTRIAL Brownhoist Gasoline and Diesel Cranes have long since passed the experimental stage. They are designed and built from the ground up for gas or diesel engine operation. The large number in use for the past many years have effected outstanding economies in material handling costs.
THE MOST ECONOMICAL WAY OF HANDLING MATERIALS
GENERAL OFFICES: BAY CITY, MICHIGAN
INDUSTRIAL BROWNHOIST
NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO

ROLLS FOR 4-HIGH MILLS BY

MIDVALE

ALTHOUGH probably the first 4-high mill was built in Sweden between 1740 and 1750, its real use is comparatively recent. Midvale has studied the advantages and requirements of both the work rolls and the backing up rolls. Midvale makes backing up rolls from 10″ up to 56″, of forged and heat-treated steel and have not had a one-piece roll fail in approximately 10 years. Midvale makes work rolls from 2″ to 44″ of forged and hardened steel.

Midvale's forged backing up rolls have an elastic limit in the journals equal to the highest tensile strength of cast rolls, while their deflection is much less than cast rolls. They usually weigh less than cast rolls. They do not distort in service. Manufactured for anti-friction bearings, they have very high strength with large ductility in the journals.

Midvale has specialized on rolls for 4-high mills for 10 years. We are happy to help anyone with rolling problems.

THE MIDVALE COMPANY
NICETOWN • PHILADELPHIA

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New York
Cleveland
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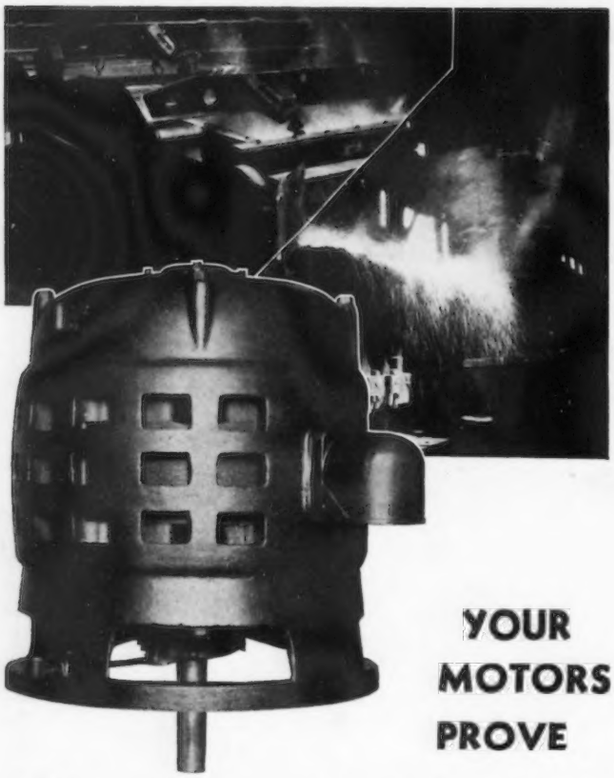
Chicago
Washington
San Francisco



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The use of Newport Electrical Sheets results in better motors.

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NEWPORT ELECTRICAL SHEETS

THE NEWPORT ROLLING MILL CO.
NEWPORT, KENTUCKY

JUST BETWEEN US TWO

Ely Needn't Worry Any More

OUR uncanny ability to lose forty or fifty cents of an evening consistently, at the infinitesimal stakes of .0001 dollar per point, caused us long ago to abandon our hope of setting up as a bridge teacher. However, we did cherish the idea of starting in as a contract instructor in a home for the feeble-minded.

But now we realize we are not even sufficiently proficient for that, for a reader writes that he did that bridge problem printed here Jan. 11 in ten minutes, *without a deck*. It took us four hours flat, with two decks and three kibitzers.

Shush, Shush

WE like the forthright candor of those two gear manufacturers who wrote us:

Gear Manufacturer "A"

"On the whole, we are heartily in favor of the NRA and are cooperating to the fullest extent possible." — **Page 27, Jan. 11 IA.**

Gear Manufacturer "B"

"The expense and annoyance of NRA has far offset any possible advantage." — **Page 32, Jan. 4 IA.**

Danger lies in the current attitude that anyone who suggests the NRA is less than perfect is a traitor or tory. Even NRA's originators recognize it as an experiment rather than as a proved panacea for our economic ills.

Those who take the dosage and refuse to tell the doctor whether they feel better, worse, or just the same, are of little help to the doctor. Loud squawks from those who are hurt are just as essential in effecting a complete cure as are three cheers and a tiger from those who are helped.

Anyway, we have always regarded blind, unquestioning loyalty as a vastly over-rated virtue. Chauvinism leads to blind alleys, even to precipices. Caustic criticism may sear a leader's pride, but it does keep the cataracts off his eyes.

Here's to more and louder criticism, favorable or adverse, so long as it is honest.

Our Bosom Bulges

LETTERS that strain our vest buttons have been pretty plentiful of late. Here's one from a conveyor manufacturer:

"Iron Age is a very necessary weekly visitor to our institution. It is daily consulted for technical and mechanical information, as well as for your well selected and written articles on all matters pertaining to manufacturing endeavor."

Feliz Año Nuevo

A BELATED New Year's card was sent us by the City of Medellin. It bears the penned signature of "Administrador de Informacion y Propaganda." We can't figure out his name, as he follows the approved foreign tradition of signing so illegibly that it is a secret between God and him.

We judge that part of the Senor's job is advertising Medellin. But the card does not even tell us in what country Medellin is located. Come, come, Senor, how are we going to spend our vacation in Medellin if we don't know where to buy a ticket for? Anyway, Happy New Year.

Sees Menace in Motor Cars

ONE to whom we recommended the prescient omniscient, "On the Assembly Line," as an Argus-eyed reporter of doings in Detroit, writes sternly:

"Less autos and more home buildings and we would not need the NRA. Hold up men all use autos. They are a crime necessity."

Having just spent a week in Washington, ironing out code wrinkles in one industry after another, we are in a position to deal with the situation. Here, Gen. Johnson, take this down before we lose the thought:

First, change auto dealers code. Make 'em ask prospective car buyers, "Do you own your own home? If so, is it paid for?" Either one or two noes, means no sale. No car if no casa (we can't get that Spanish out of our head). Second, require automobile manufacturers to make special models for hold-up men; second and third speeds to be removed. If they don't like that, let 'em go back to the good, old-fashioned horse and buggy, or roller skates. —*A. H. D.*